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Full Name of Author — Nom complet de l'auteur

Gordon Kaye Willis

Date of Birth — Date de naissance
Feb. 17, 1951

Country of Birth — Lieu de naissance
Canada.

Permanent Address — Résidence fixe
345 - 9th Street S.W.
Medicine Hat, Alberta.

Title of Thesis — Titre de la thèse
Farm Fragmentation in Southeastern Alberta:
The Hilda-Schuler District.

University — Université
University of Alberta, Edmonton

Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée
Master of Arts

Year this degree conferred — Année d'obtention de ce grade
1980

Name of Supervisor — Nom du directeur de thèse
Dr. R. G. Ironside

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FARM FRAGMENTATION IN SOUTHEASTERN ALBERTA: THE HILDA-SCHULER DISTRICT

by

© GORDON K. WILLIS

University of Alberta

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

GEOGRAPHY

EDMONTON, ALBERTA

FALL 1980

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled FARM FRAGMENTATION IN SOUTHEASTERN ALBERTA: THE HILDA-SCHULER DISTRICT submitted by GORDON K. WILLIS in partial fulfilment of the requirements for the degree of MASTER OF ARTS.

R G Ironside

Supervisor

Leonard Bauer

Date September 5th 1980

University of Alberta

ABSTRACT

The main purpose of this empirical study was to determine the spatial distribution of fragmented farms in the Hilda-Schuler district in southeastern Alberta, to explain their occurrence, to examine the effects which fragmented farms have had in the study area, and to investigate behavioural aspects of farm fragmentation.

Farmland assessment sheets, tax assessment rolls, lease records, and a dropped-off, mail-back questionnaire obtained social, economic, attitudinal and behavioural data on individual farmers and farms. Out of a total research population of three hundred and thirty-five farmers, the effective response rate to the questionnaire was forty-one percent.

An agricultural holding was defined as having two components: the land holdings either owned, rented or managed; and the operational headquarters which consisted of the residence and the fixed and mobile investments. Whenever all the land and operational headquarters were not enclosed within a single boundary, there existed a fragmented farm. Analyses of the results indicated that ninety-three percent of the questionnaire respondents had fragmented farms. The most common reasons cited for fragmenting the farm were: land availability, land prices, proximity to off-farm employment, school needs of the children, and semi-retirement.

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The farmers cited wear and tear on implements, increased production costs, and wasted time and energy in transporting machinery as disadvantages of operating dispersed parcels. Besides the disadvantages, the farmers reported advantages to farm fragmentation. When land adjacent to the farmstead was not available or had a higher market price than a distant parcel, the acquisition of detached parcels enabled the farmer to expand his operation at an affordable price. In addition, dispersed parcels increased the probability of catching scattered rain showers and avoiding localized environmental hazards such as hail.

Based on the literature reviewed and the characteristics of the study area, four sets of hypotheses were proposed:

1. The opinions, using Likert attitude measurement scales, of the farmers in the Hilda-Schuler district towards attitude statements will correlate a) positively with the greater the past farming experience, the higher the age grouping, farmers operating detached parcels, the greater the number of children, the higher the formal education level, and the greater the sources of information; and b) negatively with the higher the income level, and residency on the farm.
2. That the number of parcels operated will increase with the size (in hectares) of the farm.
3. That as the distance increases from the farmstead a) the mean parcel size will increase, b) the type of production at the detached parcel will change (arable to pasture), c) the percentage of land ownership will decrease, and d) the frequency of fertilizer input will decline.
4. That resident farmers, as compared to seasonal and non-farm residents, will a) have a higher gross family income, b) be of a younger age, c) have a larger farm size, d) have a lower percentage of their land rented, and e) have less off-farm employment.

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Only two of the relationships defined in the hypotheses were statistically significant at the .05 level of significance. They were the associations between the farmers' residence pattern and age, and gross family income level. There were, however, definite trends evident on the other relationships. Cell depletion and similarity among the farmers were the two main reasons for the associations being rejected.

A secondary purpose of the thesis was to ascertain ways through which the farmers, private sector, and government agencies are capable of alleviating the disadvantages of fragmented farms. Two proposals that were recommended were changes in the taxation laws and the implementation of consolidation and enlargement programs at the regional, provincial and federal levels.

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ACKNOWLEDGEMENTS

To my wife and friend, Linda J. Willis, for her understanding and encouragement throughout the last few years, I dedicate this thesis.

I wish particularly to express appreciation to my thesis supervisor, Dr. R.G. Ironside, for his patience, guidance and criticism during the preparation of the thesis. Thanks are also extended to Dr. O.F.G. Sitwell and Dr. L. Bauer for participating as members of the examining committee.

I am indebted to the farmers of the Hilda-Schuler District and the Alberta Department of Municipal Affairs for releasing information that made the writing of the thesis possible.

My thanks also go to Dr. J. Honsaker for his assistance with computing procedures, and to Dr. E.L. Jackson for his comments during the data analysis.

Finally, I extend gratitude for the friendship, wit, humour and moral support provided by my colleagues and friends, especially Jean-Pierre Lebourgeois, Dale Schinkel, Alvin Simms, Sandra Long and Robert Roseberg.

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I. CHAPTER ONE

INTRODUCTION

Many regional planners and farmers are concerned with improving agricultural efficiency, resource utilization, and the standard of living of the rural population. Attention to agricultural improvement has generally concentrated on ways of adjusting the scale of the farm operation by farm enlargement, by increasing the intensity of production, and on additional sources of employment to raise the income of the farmer. Agricultural research in North America has devoted less attention to improvements in the physical layout or the spatial characteristics of the farms. It is suggested here that an integrated planning approach to Canadian rural and agricultural development should include information on the causes and implications of farm fragmentation. This is especially true if the literature on farm fragmentation is correct when it refers to fragmented farms as being inefficient, expensive, inevitably bad, wasteful of human and natural resources, and an obstacle prohibiting the application of technological improvements to agriculture.

Farms are frequently thought of as single consolidated tracts of land surrounding the farmstead. Whereas, in fact, numerous farms consist of several scattered parcels of land, either rented or owned, separated by land in the possession of others. In addition, the farm operator may locate

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portions of his operational centre on the scattered parcels or in a service centre. Some farmers reside in villages or towns instead of on scattered farmsteads to take advantage of their social and economic amenities. This fragmentation of farms is not only found in the older agrarian societies of Europe and Asia, but is also evident in regions of recent agricultural settlement such as Australasia and North America. There is, however, a dearth of published literature on farm fragmentation in Canada as compared with the wealth of information on this subject in Europe. A possible explanation for the lack of Canadian literature on farm fragmentation is that researchers might assume that most Canadian farms are consolidated. For example, Lupton (1969) made the following assumption when calculating mean farm sizes in municipalities of Alberta:

> "that each farm is one holding and, although there are doubtless farms which are fragmented into two or more holdings some distance from one another, the trend in Alberta is for farmers to hold their land in a single block. If it could be demonstrated that holdings were fragmented in certain districts then this would indeed be a significant fact because there is a strong possibility that the intensity with which land is used would be affected. In this case the mean farm size would signify something somewhat different from a mean of similar value which had been computed for another municipality in which land holdings were not fragmented." (page 11)

Therefore, the aim of this empirical study is to examine the Hilda-Schuler district in southeastern Alberta, as a case study, to illustrate the significance of farm fragmentation.

The Hilda-Schuler district is located in southeastern Alberta, east of the South Saskatchewan River, west of the

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Alberta-Saskatchewan border, and northeast of Medicine Hat, Alberta (see FIGURE 3). The entire region lies within a semi-arid climatic zone, and there are no major irrigation projects present. This triangular shaped area is rural and agricultural; the major farm products being cattle, wheat, and barley. Since 1921 the rural population has declined from 3,341 to 1,006 in 1976. There is a total of three hundred and thirty-five farms ranging in size from approximately sixty-four to about 18,000 hectares.

A. PURPOSE OF THE THESIS

The main purpose of this thesis is to determine the spatial distribution of fragmented farms in a small part of southeastern Alberta, and to investigate which of the causes and effects of farm fragmentation mentioned in the literature apply within the study area. This purpose will be executed through the following objectives:

1. To define and examine the nature of farm fragmentation.
2. To indicate the relative extent and pattern of fragmented farms in the study area, in 1977.
3. To investigate the causes and implications of farm fragmentation in the study area. Because there is a scarcity of information on individual farms, a dropped-off, mail-back questionnaire was used to gather data on the socio-economic characteristics of the farm and farm operator.

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4. Another objective of the questionnaire is to investigate some of the behavioural aspects of operating fragmented farms, by analyzing the responses to Likert attitude measurement scales and several behavioural questions.

A secondary purpose of the study is to ascertain ways of reducing the disadvantages of fragmented farms. The farmers and the private sector are capable of resolving some of the problems. Government agencies can also encourage consolidation schemes. This latter approach has been, and still is, effectively used in many European countries, and may be applicable in Canada.

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B. ORGANIZATION OF THE THESIS

The research problem has been delineated briefly above. A review of the literature and a statement of the hypotheses is presented in CHAPTER TWO. Most of the literature reviewed is European because of the lack of research on farm fragmentation in North America. This chapter provides a definition of farm fragmentation, reviews the literature on the extent, the causes, and implications of farm fragmentation, and discusses agricultural decision-making as it pertains to farm fragmentation. From the literature reviewed as well as characteristics of the study area, hypotheses were formulated to be tested. CHAPTER THREE includes a description of the geographical aspects of location, physiography, climate, flora, fauna, history and

cultural landscape of the study area. Research methodology employed in collecting and analyzing the data, and a general discussion on attitude theory are dealt with in CHAPTER FOUR. The analysis of the attitude scores obtained by using Likert attitude measurement scales is presented in CHAPTER FIVE. Replies to several behavioural questions are also examined. In CHAPTER SIX, data on one hundred and thirty-seven farms are analyzed to identify the spatial characteristics of the farms such as the number of parcels per farm, and the distance to the parcels; the advantages and disadvantages of operating a spatially dispersed farm in the study area; and to suggest some means of possibly reducing the negative effects of farm fragmentation. A summary of the major findings of CHAPTER FIVE and SIX are included in CHAPTER SEVEN, the concluding chapter, followed by the limitations of the study, a discussion of the results, and suggestions for further research.

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II. CHAPTER TWO

REVIEW OF LITERATURE AND HYPOTHESES

Farm fragmentation research in Europe is extensive, but there is a paucity of studies on the spatial analyses of fragmented farms in North America. The following review of the relevant literature will be organized within five related categories. The groups are concerned with 1) the definition, 2) the extent, 3) the causes of farm fragmentation, 4) the effects of farm fragmentation, and 5) agricultural decision-making as it pertains to farm fragmentation. Thus, the objective of this literature review is to determine research conclusions about the attributes of farm fragmentation. The thesis study area in southeastern Alberta, Canada, can be examined then for any or all, of these attributes of farm fragmentation which may be present (CHAPTERS FIVE and SIX). Another objective of this review of the literature is to serve as a basis for formulating hypotheses. This chapter concludes with a statement of the hypotheses to be tested in this thesis.

A. WHAT IS FARM FRAGMENTATION?

The definition of the term 'fragmented farm' was and still is a problem. Throughout the literature numerous synonymous words have been used, and frequently writers have interpreted farm fragmentation differently. Therefore, a general review of the various terms and a synthesis will be

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presented in order to attempt to disentangle ambiguity.

To begin with, the term 'farm' as used in this thesis, should be clarified before defining a farm that is 'fragmented'. A dictionary generally defines a farm as an area of land farmed as a unit, including fields, buildings and animals, by an individual or group of individuals for the purposes of growing a crop or crops, and/or the raising of a kind of animal or animals. The term 'holding' is often used instead of the term 'farm' in the literature on farm fragmentation (see, for example, Smith, 1959; Naylon, 1959; and Lambert, 1963). The word 'unit' can be further expanded by replacing it with 'single integrated functioning system and decision-making unit' (Johnston, 1962; Hill and Smith, 1977). An individual directly responsible for the agricultural operation of a farm, whether as an owner, tenant or manager, is usually referred to as a farm operator in the North American literature (Bollman, 1973).

Comparisons of Canadian agricultural statistics with other countries are hampered by varying definitions between countries, and the changes in Statistics Canada's definition of a farm. Statistics Canada includes farm size, and an amount of agricultural products sold in their definition of a farm. These parameters, however, have varied over time:

> "Definition of a farm: In the 1941 census a farm was defined as all the land located in one municipality or census subdivision which was directly farmed by one person conducting agricultural operations either by his own labor or with the assistance of members of his household or with hired help. A farm could consist of a single tract of land or a number of separate tracts held under the same or different

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> tenures so long as the total area was one acre or more in extent and had agricultural production in 1940 valued at $50 or more. For purposes of the 1951 census, a farm was defined to be three acres or more in size with agricultural production in 1950 of a value of $250 or more. Where a farm consisted of a number of parts all of which were not situated in the same municipality, the census reported the complete farm as one unit in the municipality where the headquarters were located. In the 1961 and 1966 censuses, a farm was defined as an agricultural holding of one acre or more with sales of agricultural products during the previous 12 months of $50 or more. The headquarters rule applied as in 1951."[1]

The 1971 census was similar to the 1966 census except that an agricultural holding was defined as a farm, ranch or other agricultural operation. For the 1976 census the sales of agricultural products was raised to 1,200 dollars for the year 1975. Although each census recognizes the existence of farms with separate tracts, the statistics unfortunately do not distinguish between a farm consisting of a single tract of land and one with a number of separate tracts.

For the purposes of this thesis, a farm or agricultural holding will be defined as an area of land operated as an integrated functioning system and decision-making unit, by an individual (operator) or group of individuals (operators), having one acre (.4 hectares) or more in size with sales of agricultural products during the previous twelve months of fifty dollars or more. In addition, the farm will be considered to have two components: the land holdings either owned, rented or managed, and the

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[1]Daviault, R. Agricultural Statistics for Canada. Ottawa: Economic Branch, Department of Agriculture, Canada, April, 1971. page 1.

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operational headquarters. The latter component consists of the office or communication centre - the residence; and the operational centre which is the mobile and fixed investments such as livestock, seed, implements, vehicles, service materials, and associated structures (Eckhardt and Bayne, 1977; Hill and Smith, 1977).

In the context of this study, whenever all the land and the operational headquarters are no longer together in a single unit, there exists a fragmented farm. Most of the literature refers to farm fragmentation as being only disconnected pieces of land operated as a single farm (Binns, 1953; Fals-Borda, 1956; Naylon, 1959). Some researchers made the further distinction that the disconnected pieces of land were separated by land operated by other farmers (Sorbi, 1951; Thompson, 1963; Hill and Smith, 1977; Paul, 1977). Fragmented land holdings have also been referred to as noncontiguous (Smith, 1975; Sublett, 1975), and 'parcellement', in France (Clout, 1974). Pieces of land are also called blocks, holdings, parcels, plots, and tracts (Johnston, 1962; Smith, 1975; Hill and Smith, 1977). Although DeBarros (1963) defined a plot as a parcel of continuous, uninterrupted land, it is often used in studies discussing miniscule pieces of land (Lambert, 1963; Williams, 1976) and may imply a very small area. Therefore, it may be an unsuitable term when describing the large farm tracts of the North American Plains.

According to Binns (1953), Smith (1959), DeBarros

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(1963), and Thompson (1963) a fragmented farm consists of numerous discrete parcels of land distributed over a wide area. 'Dispersed' was used by Sorbi (1951) when making reference to parcels scattered at a great distance. Associated with extensive scattering, in Europe, are small and awkwardly shaped parcels of land which are sometimes a consequence of rural population pressure and the division of land through a gavelkind system.[2] The subdivision of land (morcellement, minifundismo) into separate farms is not farm fragmentation, but can be one of the indirect causes of it (Bergmann, 1951; Naylon, 1959). Where extreme land subdivision has occurred, creating tiny land parcels, some authors have used the words 'atomization' and 'pulverization' (Lambert, 1963; Thompson, 1963).

Smith (1975) classified farm layouts into four different shapes which were: contiguous, road separated, corner touching, and fragmented. A modification to this definition occurred when Johnston stated that a farm is not classified as fragmented when the blocks of land are separated by a road "because the road acts as a circulation route in a similar manner to the internal tracks and roads within a farm. Where the blocks of one farm are separated by a river, a farm is classified as fragmented because the rivers act not as a link but rather as a barrier" (Johnston, 1962, page 207). In contrast, Sublett's (1975) definition of a contiguous tract included corner touching parcels, tracts

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[2]The gavelkind system occurs when an estate is equally divided among the heirs.

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of land that are separated by a stream, road or railroad if the operator can cross over these barriers with his animals and implements. Two categories of farmland are distinguished by Sublett: farmstead and nonfarmstead. All the land immediately surrounding the operational headquarters is the farmstead while all the other land is nonfarmstead. The homestead tract and detached parcels were the two categories, similar to Sublett's, used by Hill and Smith (1977).

The foregoing description of the farmstead tract may be adequate for areas with scattered farmsteads, as in North America, but a majority of the fragmentation studies are on village type of settlement such as in France, Germany and Switzerland. Many farmers have their entire operational headquarters within a village, and they commute between the village and the parcels of land with their equipment and products. Other village farmers may split their operational centre, primarily granaries and barns, between the village and the parcels in order to save on transporting products and to have equipment near the site of the labour (Fiedl, 1973).

In North America, the farmers also fragment their operational headquarters by locating parts of their operational centre on dispersed parcels or by residing off the farm. Paul in his study on Saskatchewan farms commented that "grain is often stored in bins and granaries on various parcels of land" (Paul, 1977). Farmers with cattle may

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construct corrals on distant parcels in order to load cattle on to trucks instead of herding the cattle to the market or farmstead.

Australia, Canada and the United States have another facet of farm fragmentation. Residential mobility has been well documented by authors such as Hewes (1977), Hill and Smith (1977), Kollmorgan and Jenks (1958a, 1958b), Sahir (1977) and Smith (1975).[3] When the location of the communication centre or the full time residence of the operator is located on the farmstead, he is a resident farmer. However, some farmers only reside on the farmstead or other parcels part of the time and are termed seasonal residents, while others who live fulltime in a service centre are considered to be non-resident farmers (Sahir, 1977). Seasonal and non-resident farmers were identified as 'sidewalk' and 'suitcase' farmers by Kollmorgen and Jenks (1958a, 1958b) in their studies of farmers in the Great Plains of the United States.[4]

As used in this thesis the term fragmentation of a farm refers to the situation where:

1. the land (owned, rented or managed) input comprises two or more pieces, termed parcels, tracts or holdings, either separated by land operated by others, or are

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[3]For further information see Fuller, A.M., Mage, J.A., and Fuller, H.A. A Directory of Part-time Farming Studies. Vol. 1. Guelph: University of Guelph. 1977.

[4] Sidewalk farmers are operators who live in a nearby nucleated settlement. Suitcase farmers are operators who live forty-eight kilometres or more from the nearest county border containing their farm.

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corner touching, or separated by a barrier such as road or rail. Types of roads which can act as a barrier include freeways or primary, and secondary or locally improved roads, but private roads to residences or internal farm tracts are not considered to fragment the farms. Terms such as dispersed, detached, and discrete will be used when discussing parcels completely separated by land operated by others;

2. the operational centre is divided and located on different parcels or in a nucleated settlement;
3. the communication centre or operator's residence is located permanently in a nucleated settlement (non-farm resident) or the farmer has a seasonal residence in a service centre or on another parcel of land (seasonal resident). A farmer residing on the farm for at least eleven months of the year is classed as a resident farmer.

When all the operator's land surrounds the operational headquarters and is enclosed within a single boundary, the farm will be referred to as a consolidated farm. Examples of diferrent types of farm layouts are illustrated in FIGURE 1.

B. EXTENT OF FRAGMENTATION

Fragmentation of farms is prevalent all over the world (Binns, 1953; Parson, Penn, and Raup, 1956; Chisholm, 1972). Social scientists have provided some information, primarily on the European situation, on the amount of farm

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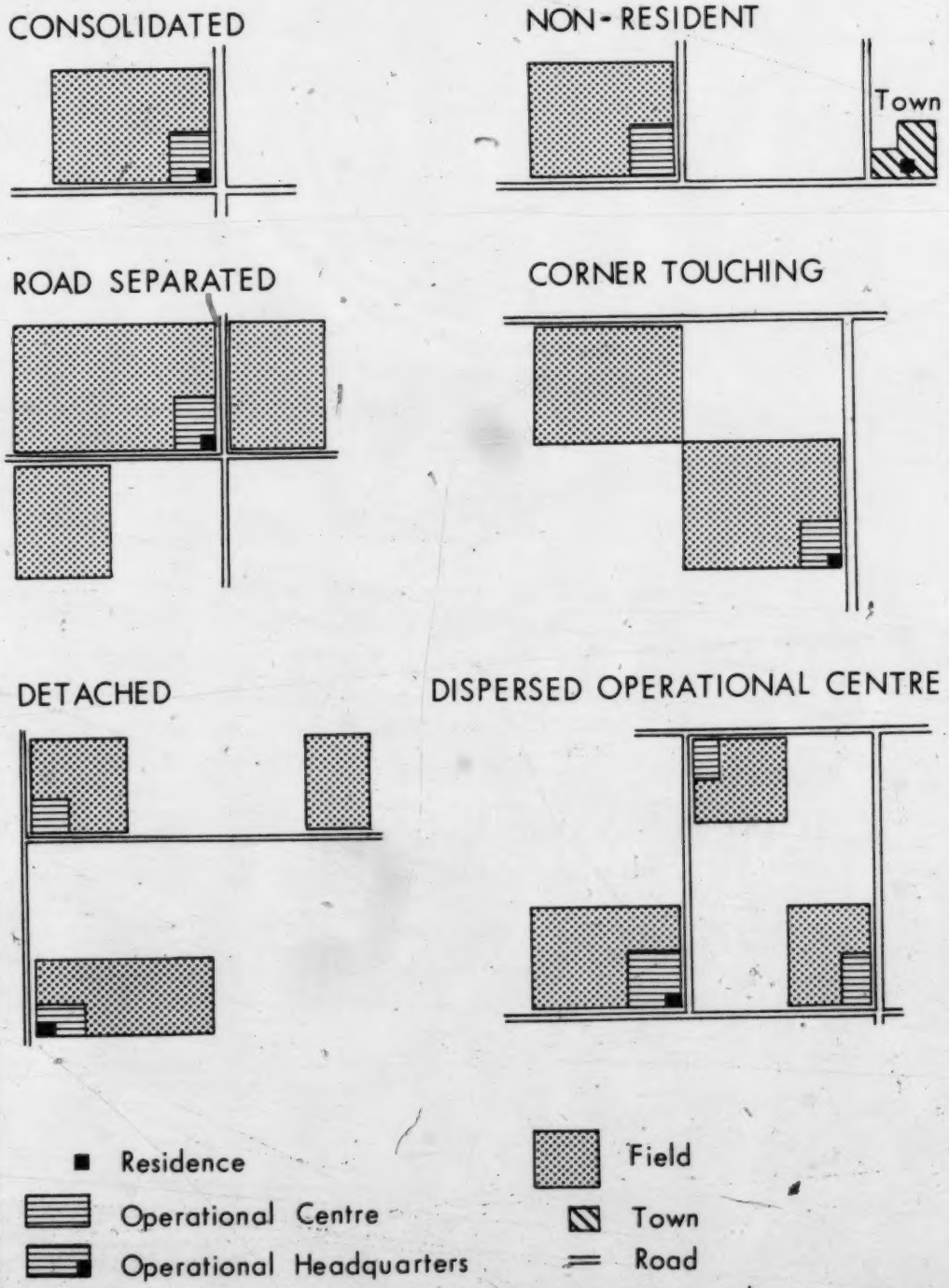
FIGURE 1 DIFFERENT TYPES OF FARM LAYOUTS



Source: Smith, 1975, 'Fragmented Farms in the United States', A.A.A.G.

fragmentation in: Britain (Edwards, 1978); France (Bergmann, 1951; Gatty, 1956; Clout, 1974); Spain (Naylon, 1959; Smith, 1959); Finland (Pihkala and Suomela, 1951); Greece (Thompson, 1963); Italy (Sorbi, 1951); Netherlands (Rienks, 1951); Switzerland (Fiedl, 1973); and Germany (Erhart, 1967; Mayhew, 1970). Although studies by Jacoby (1959) and Lambert (1963) are essentially concerned with consolidation, they do refer to the amount of farm land in need of consolidation. Jacoby suggested that approximately fifty million hectares in Europe were fragmented, and a later report by Chisholm (1972) estimated it to be one third to one half of the agricultural land. However, European countries have consolidated many farms since the writing of most of the above literature.

Beyond Europe, there is a scarcity of literature on fragmented agricultural holdings for individual countries, and what does exist consists mainly of one paragraph statements. A few exceptions to this are: Australasia (Johnston, 1962; Hill and Smith, 1977); Columbia (Fals-Borda, 1956); India (Zaheer, 1975); Jamaica (Edwards, 1961); Nigeria (Igbozurike, 1976); southern Africa (Stevens and Lee, 1979); Taiwan (Vander Meer, 1975; Williams, 1976); and United States (Kollmorgen and Jenks, 1958a and 1958b; Smith, 1975; Sublett, 1975; Pyle, 1977). In Canada, fragmentation has been examined by DeLisle (1978) in eastern Ontario and southern Manitoba, Ironside (1979) in southern Ontario, Paul (1977) and Sahir (1977) in southern

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Saskatchewan, Boylen (1976) in Alberta, and Redpath (1974) on Nova Scotia. DeLisle (1968) conducted a larger study on the effects of farming detached parcels on farms in the dairy belt of eastern Ontario.

To describe the present extent of fragmented farms in the world would be an immense project requiring several volumes, and would be very time consuming. However, a general indication of the extent of farm fragmentation in the world should be mentioned and this is presented in TABLE 1. This data is not comparable because the sources of information vary, dates of the data are different, and some figures only apply to small areas within countries. Although the table is out of date, most of the countries still experience extensive fragmentation of farms.

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C. CAUSES OF FRAGMENTATION

Analysis of the ways in which fragmented farms have developed is essential in ascertaining its consequences. Origins of farm fragmentation will be broadly grouped into three categories: 1) physical-environmental, 2) social and economic, and 3) psychological.

Physical-Environmental

Spatial variations in climate, soils, terrain, and other physical characteristics of the land have induced farm fragmentation (Thompson, 1963). Farmers fragment their land to catch patchy rains (Hill and Smith, 1977) or to increase the probability of avoiding localized hazards such as

TABLE 1

EXTENT OF FARMLAND FRAGMENTATION IN DIFFERENT COUNTRIES

COUNTRY	AVERAGES PER FARM UNIT[1] FARM SIZE ha.	NUMBER OF PARCELS No.	SIZE OF PARCELS ha.	DISTANCE TO PARCELS km.	ESTIMATED DATE OF FIGURES	FARM CONSOLIDATION[2] IN NEED OF CONSOLIDATION ha. (000's)	ESTIMATED YEARLY RATE OF CONSOLIDATION ha. (000's)	OTHER SOURCES AND NOTES
Australia	4821.0	2.53	1548.0[3]	29.5	1974			Hill & Smith (1977); in Eyre Penninsula.
Austria		25.0	.73		1959	1,100	60	
Belgium				0.3 to 1.0	1962	1,100	18	
Bulgaria				0.3 to 1.0	1962			
Canada	200.3	5.69	35.2	9.1	1971			DeLisle (1978); in Manitoba.
China		6.0*		0.6	*1949, 1962			Vander-Meer (1975)
Cyprus	6.6	10.0			1959	250		
Denmark	15.0	1.0 to 3.0			1959			
Eire	4.0	2.0 to 40.0			1959	90	13	
Finland		3.3	5.9	.65*	1948,*1962	2,000	50	Pihkala and Suomela (1951)
France	1.88	2.2	.87	0.3 to 1.0*	*1962, 1969	13,150	600	Clout (1974)
Germany	6.8	10.1	.67	0.3 to 0.2*	1959,*1962	8,480	257	
Greece	3.0 to 4.0	25.0	0.1 to 0.2		1959	2,000	21	
Italy	2.25	5.7	0.5		1959	10,000	100	
Jamaica	13.6	3.6	2.4	4.0	1970			Igbozurike (1976)
Japan	.8	10.0 to 20.0	.06		1951			Parson, Penn and Raup (1956)
Luxemberg						100	Not Begun	
Netherlands	9.7	3.9	2.46	0.3 to 0.1*	1959,*1962	1,216	45	
Nigeria	6.9	5.0	0.77		1973			Igobozurike (1976)
Norway	4.6	31.1			1959	2,000	45	
Pakistan				0.8 to 3.2	1962			
Phillippines		3.0						Vander-Meer (1975)
Portugal						2,000	Not Begun	
Rumania				0.7 to 2.5	1962			
Spain	8.7	15.0	1.0	0.3 to 6.0*	1959,*1962	967	10	
Sweden	9.0	2.0 to 3.0			1959	5,000	50	
Switzerland	5.2	10.0	.51	0.3 to 0.1*	1959,*1962	485	12	
Taiwan		3.0						Vander-Meer (1975)
Turkey						450	Not Begun	
United States		2.4	29.1	6.1	1978			Pyle (1977); in South Carolina

1. Figures from Lambert (1963).
2. Figures from Jacoby (1959) and Chisholm (1972).
3. Mean parcel size within the study area.

drought; flood, frost, hail, avalanche and high winds (Fals-Borda, 1956; Fiedl, 1973). Local variations in soil and in water conditions can be obtained with a fragmented arrangement of parcels. Different soils permit the farmer to produce a range of crops, and to acquire land with different productive capacities. On the plains a farmer may diversify his operation by placing livestock on land of poorer quality while leaving more productive soils for hay or crops. In the mountain regions, for example Columbia, Switzerland and Norway, some farmers have mountain pastures, lowland crops, and wooded lots (Binns, 1953). Using the terrain to diversify and fragment their operation, they are provided with income, food, and a balanced workload year round (Thompson, 1963). Also land adjacent to a farm might be unsuitable for agricultural purposes because of rocky outcrops, alkaline soils, steep slopes, or waterlogging.

Fragmentation of some farms is created by physical conditions not connected with agriculture. These conditions include the construction of roads, railways, irrigation works, canals, fences, enclosures, airfields, buildings, game reserves, military installations, and recreational parks (Binns, 1953). Any of the above causes may "produce an unintended but unavoidable fragmentation of some farm holdings" (Thompson, 1963, page 9).

Social and Economic

Social and economic reasons are among the most cited factors directly or indirectly inducing the fragmentation of

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agricultural holdings. Seventeen causes were mentioned in the literature reviewed. They are:

1. Population pressure

   A steadily increasing rural population and a lack of opportunities for employment outside agriculture tend to "increase the ratio of farmers to land and capital, reducing the farm size, and often accompanied by fragmentation" (Hill and Smith, 1977, page 158).

2. Decline in farm population

   "Fragmentation in some areas is associated with a decreasing ratio of farmers to land and capital ... In this context fragmentation is usually asserted to be an unfortunate consequence of farms becoming larger by the acquisition of non-contiguous land" (Hill and Smith, 1977, page 159). Sahir (1977) commented that the size of the farm is a major determinant of the number of parcels. In addition, Edwards (1978) investigated the changes in farm size in Somerset, England and found a positive correlation between farm size and the number of fragmented parcels. However, Hill and Smith (1977) and Igbozurike (1976) suggested that there are other major factors besides farm size.

3. Gifts and inheritance traditions

   Fragmented farms can be an indirect consequence of the gavelkind system where the division of real estate would be divided equally among the heirs (Binns, 1953; Smith, 1959; DeBarros, 1963; Thompson, 1963; Mayhew, 1970;

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Fiedl, 1973; Clout, 1974; Zaheer, 1975). Fragmentation can also occur under the tradition of primogenture where the estate is inherited by the eldest son. Yajima (1963) states that an example of this can be found in Japan prior to World War II.

4. Open-field system

Some fragmentation in Europe is a legacy of the open-field system of cultivation (Lambert, 1963; Mayhew, 1970; Chisholm, 1972; Smith, 1975).

5. Townward drift of farm population

In many countries, for example Greece, the village type of agricultural settlement has existed for years but some countries have scattered farmsteads. With the agglomeration of service functions into urban centres, many farmers have moved from the farmstead to take advantage of economic, educational and social amenities of an urban centre. Once a farm becomes fragmented, the farmer's residence may be more advantageously located near a service centre. Income can be increased by taking employment in an urban centre during the off-season (Gill 1971).

6. Age and income

Employment off the farm provides additional capital to young individuals eager to establish themselves in farming. Farmers who have bought farms wanting to increase their disposable income to pay their mortgages or to maintain a desired standard of living may

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contemplate enlarging their agricultural holdings. Middle-aged or older farmers, free of the responsibilities of raising children and/or large land or machinery liabilities, may be satisfied with their present farm size and standard of living (Smith, 1975). Another group of farmers considering semi-retirement or retirement possibly due to declining physical stamina may sell out or rent parts of the farm to other farmers or to an heir.

7. Land availability

   Acquisition of additional parcels of land is confined to land which is available or offered for sale (Smith, 1975; Williams, 1976). When a farmer is ready to buy, the neighbours might not be ready to sell. Pressure to enlarge the farm to maintain an acceptable standard of living, in either densely or sparsely populated agricultural regions, may force a farmer to acquire land wherever it is available (Smith, 1975).

8. Resources at the right moment

   Even if land adjacent to the farm becomes available, an operator may not have the finances or equivalent credit at that particular time.

9. High price of land

   High priced land adjacent to the farm might be more costly than would be the diseconomies associated with purchasing or renting a cheaper detached parcel. Speculation and competition for land increases the land

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value which in turn encourages land sub-division.

10. Proximity to relatives

If a farmer has relatives at another location, it may be worthwhile acquiring land nearby because he can then include social visits, have relatives watch over the land, and possibly reduce machinery movement by borrowing the relative's equipment. Another associated factor would be the improved channels of information about land availability in another region.

11. Reduction of labour, time and travel

It is sometimes more efficient to have buildings such as granaries or storage sheds on scattered fields to reduce the time and labour of transporting products and implements to and from the operational headquarters.

12. Relatively cheap and abundant energy

Prior to the 'energy crisis', North American farmers were able to travel long distances to scattered parcels because of relatively cheap and abundant energy (Smith, 1975). Chite, a source of fuel in Columbia, grows wild at certain altitudes; therefore farmers acquire land there instead of purchasing costly fuel at the market (Fals-Borda, 1956).

13. Mechanization

Farm enlargement has been partially prompted by the increased size and expense of farm implements. Small farms need more land to make efficient use of large expensive machinery (Sublett, 1975).

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14. Greater mobility

    Countries with mechanized agriculture and a good transportation network which allows farmers to move themselves and equipment quickly and easily from parcel to parcel.

15. Security and investment

    Land is sometimes thought of as security and a source of capital investment. Investment firms are not always available, and land is more stable in value than currency in many lesser developed countries, thus peasants will 'bank' their meagre savings in available parcels of land (Fals-Borda, 1956; Gatty, 1956; Zaheer, 1975). This might cause land prices to increase.

16. Social advancement

    In some countries there is prestige associated with land ownership. By purchasing land whenever and wherever possible, an individual may be able to improve his social status within the community because he owns a lot of land (Lambert, 1963).

17. Market instability

    Low prices for agricultural products and uncertain markets for goods may persuade a farmer to diversify his operation which may indirectly lead to a fragmented farm. An example of this would be a grain farmer acquiring pasture land on the mountain slopes for livestock.

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Socio-pyschological Factors

The social and psychological aspects of individual farmers influences their decision-making. The decision to purchase or rent a detached parcel of land or to become a non-resident or seasonal resident farmer is influenced by his attitudes, values, goals and perceptions of his environment. An example of the above may be a farmer's attitude towards risk aversion by fragmenting his land to avoid perceived environmental hazards. Another farmer may refuse to rent or buy adjacent land because of certain dislikes about the land or land owner. According to Binns (1953), pyschological factors such as the landowner's desire to effect a fair division of land among heirs frequently leads to fragmentation. Heirs may feel they have the right to demand an equal share. There is also the attachment to the soil or the importance of actual possession of land (Sargent, 1952; Binns, 1953; Gatty, 1956). Other farmers may desire economic advancement by farm enlargement.

In many instances more than one cause, physical, socio-economic, or socio-pyschological, can be attributed to farm fragmentation. The cause or combination of causes varies between agricultural regions depending upon variations in economies, societies, and physical settings; and upon variations in attitudes and behaviour between farmers. The phenomenon of fragmentation can occur under different forms of land tenure and during either land subdivision or farm enlargement.

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D. EFFECTS OF FARM FRAGMENTATION

The literature stresses the problems associated with operating a fragmented farm. Fragmentation of land and farm buildings has been usually referred to as inefficient, expensive, an irrational practice, and wasteful of human and natural resources. It is true that difficulties arise from operating a farm comprised of a number of physically separated parcels (Binns, 1953). Situations where a farm consists of numerous widely scattered parcels have been called 'excessive' fragmentation. Usually this degree of fragmentation is such that the natural advantages are outweighed by the negative effects. Although most of the effects of fragmentation of agricultural holdings are adverse, circumstances exist in which positive advantages may outweigh the disadvantages. A limited amount of fragmentation can be desirable or inevitable (Lambert, 1963; Thompson, 1963). A general list of the negative and positive effects, found throughout the literature, of farm fragmentation follows.[5]

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Negative Effects

Environmental, economic and social disadvantages arise from operating a fragmented farm. The environmental disadvantages will be discussed first. Principles of soil conservation are neglected when a haphazard arrangement of

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[5]Further discussion on the effects of farm fragmentation can be found in Binns (1953), Gatty (1956), Smith (1959), Zaheer (1975), and Hill and Smith (1977).

parcels does not take into account the slope of the land permitting soil erosion (Sargent, 1952). Disease, pest and weed control are rendered useless because some farmers neglect or reduce supervision over distant parcels, particularly when they are small and inconveniently situated (Fals-Borda, 1956). In addition, small irregular shaped fields increase the amount of valuable farm land sacrificed through the multiplicity of canals, paths, roads, and demarcation boundaries (Thompson, 1963; Clout, 1974). According to Chisholm's (1972) observations on a sample of scattered parcels in the Netherlands, the application of fertilizers (manure) decreases with distance from the farmstead which may indicate soil depletion of distant parcels. This relationship exists because travel time and transportation costs increase with distance from the farmstead. A study by Hill and Smith (1977), however, indicated that Australian farmers did not exhibit a strong distance-decay effect when using chemical fertilizers. Stevens and Lee (1979) found that distance did not provide a satisfactory explanation of variations in yield in a case study in Lesotho, southern Africa. Nevertheless it has been claimed that neglect or the reduction of labour input into distant parcels leads to a waste of resources through inefficient use of the soil (Chisholm, 1972; Zaheer, 1975; DeLisle, 1978).

There are a number of economic disadvantages to the farmer with a fragmented farm. Zaheer stated that a

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fragmented holding "has a retarding effect on the agricultural economy" and "is a high cost unit and much less viable than a consolidated unit" (1975, page 89). Time and energy is wasted transporting additional help, themselves, their animals, fertilizer, implements, and seed to and from the farmstead and from one detached parcel to another (Fals-Borda, 1956; Thompson, 1963; Fiedl, 1973; Clout, 1974; Smith, 1975). Extra costs are associated with the loss of time and the transporting of inputs and outputs.[6] Supervision of livestock and crops becomes more difficult, and therefore, increases the likelihood of theft and vandalism to the property (Binns, 1953; Fals-Borda, 1956). Extra help may be required to watch over the livestock and crops. Scattered parcels increase the costs of building and maintaining fences. There are also difficulties in optimizing the timing of operations or organizing activities for all the parcels (Smith, 1975; Hill and Smith, 1977). Serious access problems have to be contended with. Many parcels are completely surrounded by another man's property and access requires permission to cross the neighbouring land. This can lead to land abandonment or a delay in the execution of necessary operations. If the access roads or paths are narrow, in poor condition or absent, mobility is restricted especially in poor weather conditions (Fiedl, 1973; Clout, 1974; Sublett, 1975). In addition, certain

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[6]Extra costs include fuel, lubricants, and road wear and tear on the machinery. See Sublett (1975) for a detailed discussion on these costs.

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roads and bridges may have to be redesigned to accommodate large machinery (Sublett, 1975).

In many European and Asian countries the landscape resembles a jigsaw puzzle made up of tiny, irregular shaped fields seldom forming consolidated farms. Awkwardly shaped and miniscule fields prevent taking advantage of technological improvements and regional planning (Fiedl, 1973). Mechanization of agriculture is difficult, if not impossible, to introduce because the use of machinery is less efficient and less economical on small parcels (Fals-Borda, 1956; Gatty, 1956). Furthermore, modern machinery may not have sufficient room to maneuver. Therefore, areas inaccessible by machinery may have to be cultivated by hand. Improvements in the land such as irrigation and drainage schemes, and soil improvement, require permission and close cooperation of many individual tenure-holders which consequently impedes regional planning.

Social disadvantages occur with farm fragmentation. Social conflict is the most obvious effect. Conflict can erupt over trespassing or trying to receive permission to cross a neighbour's land to reach detached parcels. Also, access and rights to water resources give rise to disputes or even litigation (Smith, 1959). If fragmented fields are not clearly or legally demarcated, endless squabbles or legal action over boundary claims between members of the community sometimes occur (Williams, 1976). These disputes can cause a strain on social relations of the entire

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community. Traffic congestion can create conflict between the farmers and the motorists. Slow moving, large farm machinery on public roads presents a traffic hazard to other motorists and they become irritated because the implements hinder the flow of traffic. Farm machinery on the road during sunrise and sunset, especially implements extending into the oncoming lane, pose a serious traffic hazard.

The forementioned negative factors can reduce the productivity of the land, result in a formidable waste of labour, time, and energy, and lower the income of the operator. Zaheer commented that: "In areas where soils are poor and the average yield low, the disadvantages of fragmention are further intensified." (1975, page 88). Although the soils are inherently fertile, the dryland farming belt of southeastern Alberta and southwestern Saskatchewan experiences severe moisture deficiency conditions which lowers the average yield.

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Benefits of Fragmentation

Farm fragmentation is not always disadvantageous. This view is only just receiving the attention it deserves (Fiedl, 1973; Smith, 1975; Hill and Smith, 1977; Pyle, 1977). Variations in weather and soil capability are two important reasons. Acquisition of a detached parcel is a means of reducing risk by increasing the chance of escaping localized weather hazards. Similarly a fragmented holding has greater diversity of soil types and growing conditions (Hill and Smith, 1977). In addition, the farmer can "stretch

out his peak work periods such as planting and harvesting, according to the altitude and exposure of various plots" (Fiedl, 1973, page 33). In mountainous regions farmers rely on mountain pastures for livestock grazing and bottom land for crops. This can increase their income and improve their standard of living at a subsistence level (Fiedl, 1973). A similar arrangement is feasible in other areas of varing topography such as hilly and rolling landscapes.

The following advantages are essentially of economic and social value. A land parcel adjacent to the farmstead might be more costly than a distant one. The cheaper, distant parcel, is only beneficial if the diseconomies of fragmentation do not surpass the price difference (Hill and Smith, 1977). Farm enlargement is another means of meeting rising agricultural costs. With land availability being limited, purchase or rental of detached parcels "enables the farm operator to achieve the necessary expansion of his unit" (Pyle, 1977, page 3). The dispersion of the residence and the operational centre also has some advantages. Farmers residing within a service centre can enjoy the economical, educational and social benefits of an urban life, thereby improving their consumption efficiency but possibly reducing production efficiency (Hill and Smith, 1977). Travel costs and time to engage in non-farm activities are reduced then, and in certain cases a non-farm residence may be at a better 'economic distance' to the scattered parcels than would a farmstead location. According to Fiedl (1973, page 34) the

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> "fragmentation of buildings is essentially beneficial. It allows for a more intensive use of the land by providing necessary space and equipment on or near the actual site of the labor."

Finally, an advantageous social effect of fragmented holdings worth mentioning is that family functions and interests are diffused throughout the region, which may lead to a greater development of primary group relationships (Smith, 1959).

Although there are advantages to a fragmented farm, it would appear from this review that the negative effects are more frequently mentioned and are of greater significance. How a farmer approaches most of these disadvantages or beneficial effects depends upon his decision-making process, which will be discussed next.

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E. AGRICULTURAL DECISION-MAKING

Along with the physical-environmental, social and economic factors, agricultural decision-making is also influenced by the socio-psychological aspects of the farmers (see FIGURE 2). The attitudes, values and goals of individual farmers, as a factor in the agricultural decision-making process, have only recently been investigated by geographers.[7] Harvey (1966), in an extensive article on agricultural land use patterns, referred to agricultural patterns as being the result of numerous

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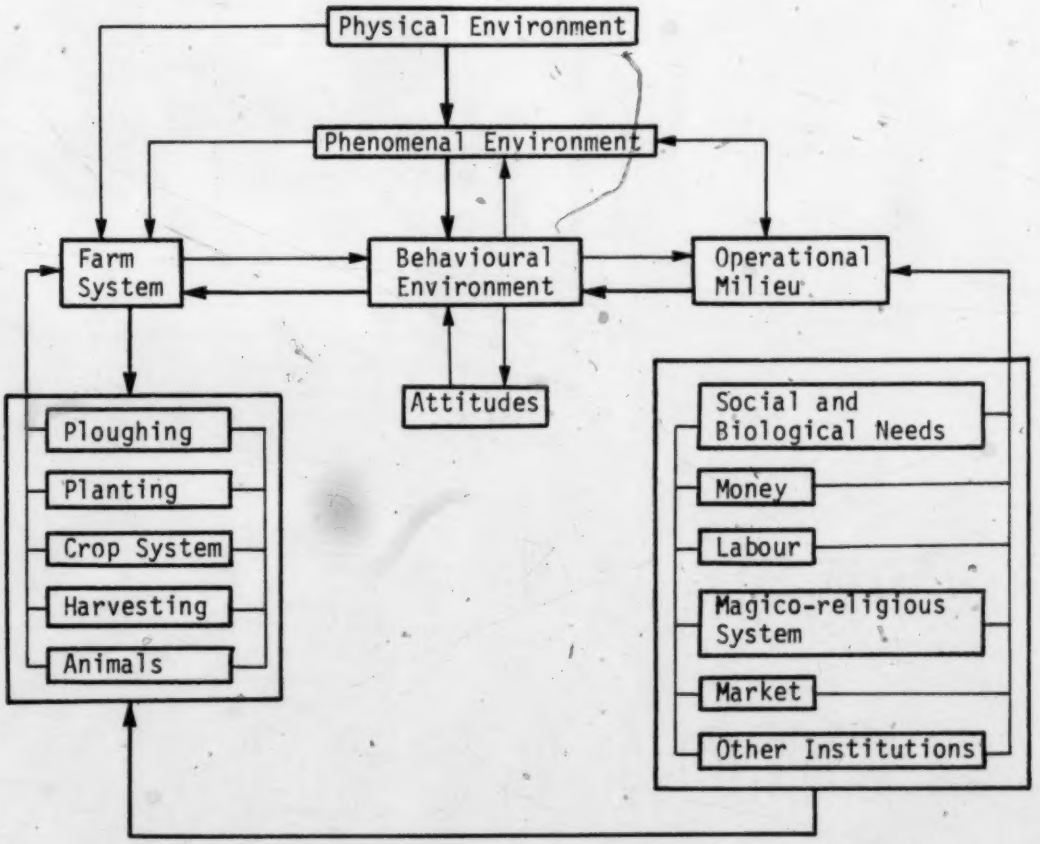
[7]For a review of approaches to, and models of agricultural decision-making see Ibery (1978). A further review on attitudes and behaviour in geography can be found in Golledge, Brown, and Williams (1972).

FIGURE 2 THE AGRICULTURAL SUBSYSTEM



The factors involved in the development of the agricultural landscape, including the needs of society, values and attitudes, and the constraints of the physical-phenomenal environment.

Source: Hurst, 1972, A Geography of Economic Behaviour, p. 82.

individual decisions and "any theoretical model developed to 'explain' agricultural patterns must take account of pyschological and sociological realities" (page 373). In Smith's 1975 article on Fragmented Farms in the United States, he stated that:

> "More recent research has related geographic variation to individual choices...Farm layouts result from innumerable individual choices and judgements. They furnish the framework for evaluating and interpreting other cultural expressions in agricultural lands" (page 69).

Only by evaluating and interpreting socio-pyschological factors along with the economic orientation of the farm and the properties of the natural environment, can the agricultural geographer be able to better understand local and regional variations in the agricultural activities.

Some of the socio-psychological factors influencing farm fragmentation are: attachment, attitude, choice, goals, perception, risk and uncertainty. Farmers may desire different soils or desire each heir to equally share in the inheritance. If a farm is too small to provide the desired standard of living, a farmer may have an incentive to obtain more land even if it is not adjacent to the farmstead (Johnston, 1962). Yetminster farmers in Dorset, England were questioned about plans for buying and selling land. Butterwick and Rolfe (1965) found that the older farmers had the attitude that land was regarded as 'something close to sacred' and to sell inherited land was to admit failure, while the younger generation (under fifty-five years of age) generally considered land as another factor of production

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along with livestock or machinery. Farm operators have attitudes which predispose them to behave in certain ways or make certain choices. Choices in land acquisition are restricted to known available land, knowledge of available land partly depends on the farmer's sources of information and his ability to use that information (Found, 1971; Ibery, 1978). A study on the choice of residence by wheat farmers in southern Saskatchewan was conducted in 1971-1972 by Sahir (1977). This research suggested that personal decisions "frequently are more strongly associated with moves off the farm than the socio-economic differences" of the respondents (Sahir, 1977, page 61). Kollmorgen and Jenks discussing the mobility of farmers and farm fragmentation, commented that "many amenities are gained by living in town, a location often preferred by women..." (1958b, page 220).

Risk and uncertainty play an important role in agricultural decision-making(Wolpert, 1964; Chapman, 1974). A farmer's perception of his environment may partly determine his aversion to risk and uncertainty. Response to environmental risk, for example frost or hail, influences some farmers to acquire detached parcels to increase the probability of escaping localized environmental hazards (Fiedl, 1973).

Machinery breakdown and landlord-tenant relations are other areas of uncertainty. Rough roads between detached parcels can potentially damage machinery. Verbal rental agreements with a neighbour can have greater uncertainty

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than with a relative or vice versa.

A Likert attitude scale was used by Boylen (1976) to investigate the attitudes of Alberta farmers towards farmland tenure attributes. Several of the attitude statements were related to farm fragmentation such as risk and uncertainty, farming efficiency, land availability, and land ownership. They indicated a socialistic philosophy towards making a profit from land sales, that the supply of land for farming was unlimited, that owned land was not farmed more efficiently, and disagreement that land ownership meant certainty of having land to farm.

Attitudes towards risk aversion and uncertainty, farmers' perception of their own environment, choice of agricultural enterprise or residential location, and their willingness to adopt new innovations are only some of the pyschological aspects associated with the decision-making process of farm operators (Ibery, 1978). Decision-making by a farmer is an individualistic process because of variations in attitudes between farmers and their operating environments. To better understand and analyze the geographic patterns in the agricultural landscape, geographers need to give greater attention to the socio-pyschological aspects of farming.

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F. HYPOTHESES

The focus of this thesis is to examine the spatial structure of the farm units in a small part of southern Alberta, that is; to determine the distribution of fragmented farms, explain their occurrence, and investigate the implications associated with this type of layout in an agriculturally advanced society such as rural Alberta, Canada. Based on the information from the literature reviewed and the characteristics of the study area the following hypotheses were formulated:

1. The opinions, using Likert attitude measurement scales, of the farmers in the Hilda-Schuler district towards attitude statements will correlate a) positively with the greater the past farming experience, the higher the age grouping, farmers operating detached parcels, the greater the number of children, the higher the formal education level, and the greater the sources of information; and b) negatively with the higher the income level, and residency on the farm.
2. That the number of parcels operated will increase with the size (in hectares) of the farm.
3. That as the distance increases from the farmstead a) the mean parcel size will increase, b) the type of production at the detached parcel will change (arable to pasture), c) the percentage of land ownership will decrease, and d) the frequency of fertilizer input will decline.

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4. That resident farmers, as compared to seasonal and non-farm residents, will a) have a higher gross family income, b) be of a younger age, c) have a larger farm size, d) have a lower percentage of their land rented, and e) have less off-farm employment.

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III. CHAPTER THREE

STUDY AREA: THE HILDA-SCHULER DISTRICT

This chapter describes the geographical aspects of location, physiography, climate, fauna, flora, history and cultural landscape of the study area.

A. LOCATION

Located in southeastern Alberta, Canada, the study area is a triangular shaped area approximately eighty kilometres long (north-south) by about fifty kilometres wide (east-west) with the South Saskatchewan River forming the hypotenuse. More precisely, the boundaries are: on the west, the South Saskatchewan River; the Alberta-Saskatchewan border forms the eastern limit; and the southern perimeter is the southern limits of township thirteen which coincides with the southern limits of enumeration area twelve of the 1976 enumeration district 812. This area covers about 260,320 hectares or 2,603 square kilometres(FIGURE 3).

Several factors were considered when choosing the location, size and shape of the aforementioned study area. Firstly, this area contains no major irrigation projects. The author did not want to include an area which has experienced substantial land improvement such as irrigation. If the natural environment is a factor in farm fragmentation, then irrigation schemes might modify its effect. Secondly, to maintain consistent administrative

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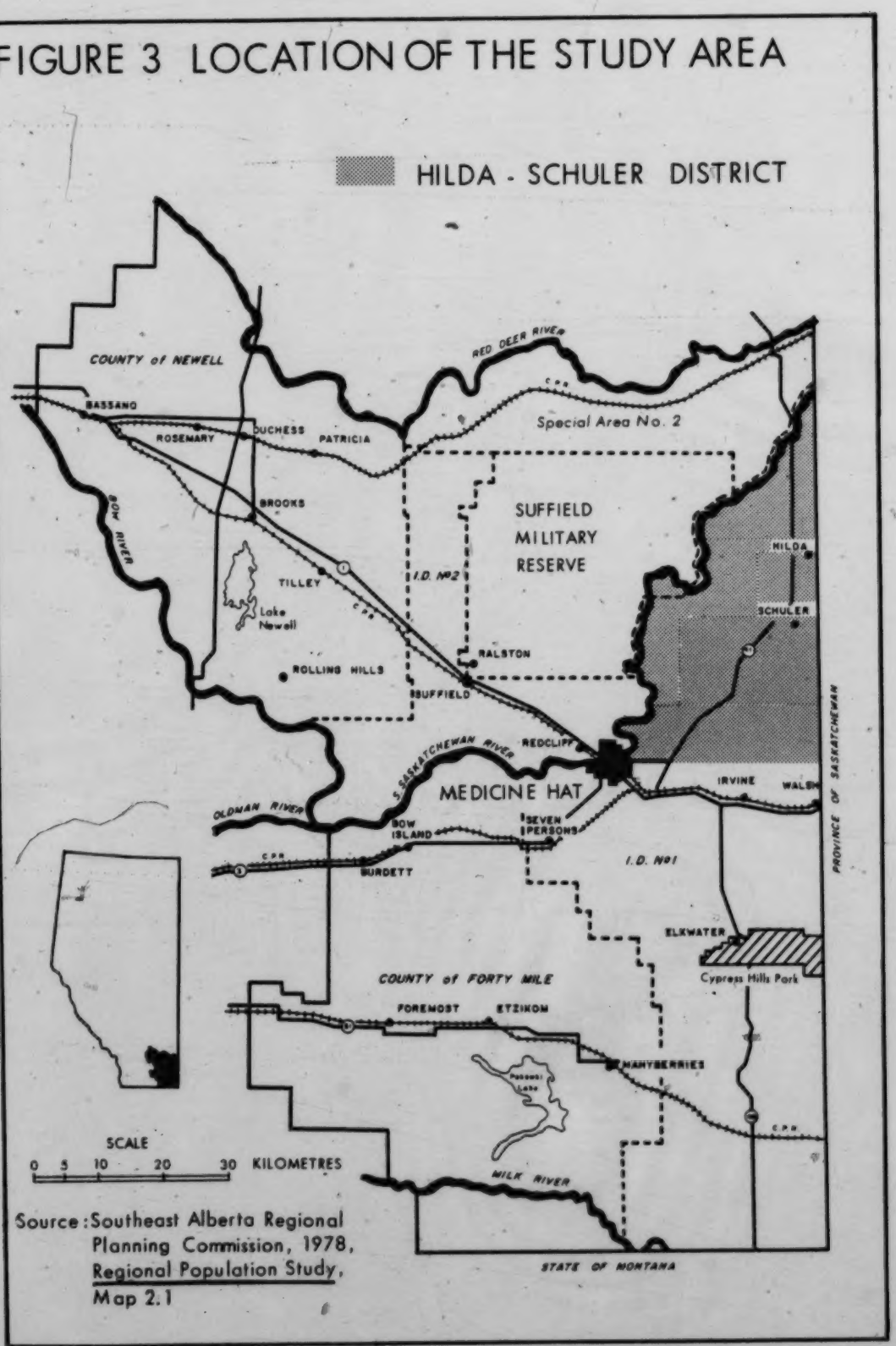
FIGURE 3 LOCATION OF THE STUDY AREA



Source: Southeast Alberta Regional Planning Commission, 1978, Regional Population Study, Map 2.1

units, the area is wholly within the planning boundaries of the Southeast Alberta Regional Planning Commission, Census Division One and Improvement District One. Finally, the Alberta-Saskatchewan border was chosen because the thesis is concerned only with Alberta. Also, the political and legal institutions governing the ownership and leasing policies of Saskatchewan may be different from Alberta.

The area appears to be adequately representative of the ranching and dryland farming in southeastern Alberta. This evaluation is based on personal experience, agricultural census data, and by comparing the environment of the study area to the rest of southeastern Alberta. The study area is within the same soil, climatic, and vegetation zone and is similar in topography to the rest of southeastern Alberta. Twenty-eight percent of the rural population of the study area is involved in farming and horticulture while Census Division One has thirty-three percent according to the 1971 census.[8] Also the 1976 agricultural census data indicates that Improvement District One, in which the study area lies, the major farm products are cattle, wheat, barley, oats and tame hay. Census Division One has the same major farm products.[9]

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[8] The study area is within the 1971 enumeration district of 812 and includes the following enumeration areas: 13, 15, 16, 17 and 18. The 1976 enumeration area data on occupations was not available.

[9] This is based on Table 24 from Census of Canada, 1976, Agriculture: Alberta, Catalogue 96-809, Volume 13, Ottawa: Statistics Canada, 1978: 24-1, 24-2.

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B. REGIONAL PHYSIOGRAPHY

Southeastern Alberta is situated in the western most prairie level, the Third Prairie Plain, of the Interior Plains (Putnam and Putnam, 1970). Except for the tertiary outcropping, and the upper Cretaceous and tertiary bedrock in the Cypress Hills, the district is underlain by upper Cretaceous bedrock composed of non-marine sandstone and shale, and mainly marine shales. Most of the area has been glaciated, therefore the bedrock is mantled with glacial till deposits varying from gently undulating ground moraine to hummocky ablation moraine. Also, the landscape is occasionally interrupted by glaciolacustrine and glaciofluvial deposits. The Cypress Hills were unglaciated during the Wisconsin advance and today provide a parkland oasis in a rather treeless plain (see FIGURE 3).

Two prominent features rise above the short grass plains: the Cypress Hills rising 1,065 to 1,465 metres above sea level or approximately 550 metres above the surrounding plains, and the Milk River ridge, an elevation of 1,250 metres, with 274 metres of relief. Incised into the till plains are the South Saskatchewan River, the Red Deer River, the Milk River, and locally extensive glacial meltwater channels. Apart from the small area south of the Milk River ridge which drains into the Missouri drainage system, the whole area is essentially drained by the Red Deer River and South Saskatchewan River which are part of the Hudson Bay drainage basin. Closed internal drainage basins are usually

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small and local. Surface waters consist of small lakes and innumerable seasonal ponds. Brown soils dominate the region except for the dark brown and thin black soils found in the Cypress Hills.

C. LOCAL PHYSIOGRAPHY

Bedrock and Surficial Geology

The distribution of the bedrock and surficial deposits is illustrated in FIGURE 4. Quaternary deposits are underlain by upper Cretaceous bedrock consisting of the Bearpaw (marine), Foremost (non-marine), and Oldman (non-marine) formations. Consisting of argillaceous sandstone, bentonitic shale, silty shale, and thin concretionary ironstone and bentonite beds, the Bearpaw formation covers most of the study area. Oldman beds are mostly in the southern half of the study area and composed of sandstone, siltstone, shale containing concretionary ironstone beds, and some coal. Paralleling the South Saskatchewan River the Foremost formation consists of interbedded sandstone, siltstone, and shale containing coal seams and concretionary beds.

Ground and hummocky moraine dominate the central portion of the study area while glaciofluvial and glaciolacustrine deposits are found in the north. Adjacent to the Many Island Lake, the surficial deposits are lacustrine. Less extensive aeolian and alluvial deposits are located near the South Saskatchewan River.

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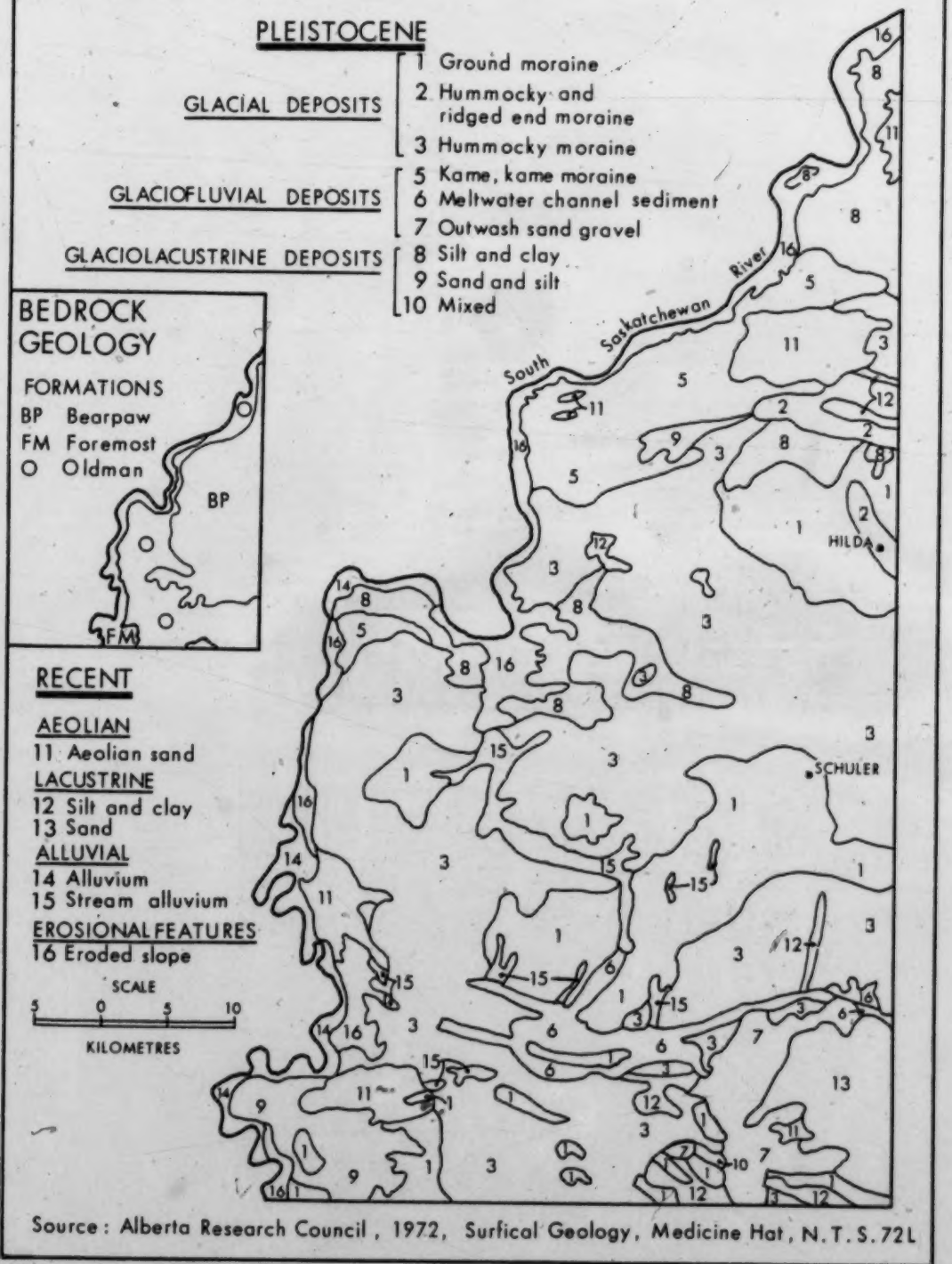
FIGURE 4 BEDROCK AND SURFICIAL GEOLOGY

SURFICIAL GEOLOGY



Source: Alberta Research Council, 1972, Surfical Geology, Medicine Hat, N.T.S. 72L

Topography and Drainage

Topography is mostly level with areas that are gently undulating (see FIGURE 5, and PLATES 1 and 2). The only variation in topography are the South Saskatchewan River which is about 90 to 120 metres below the prairie level, and the extant melt water channels such as the one by Red Deer Lake. Most of the area is at an elevation of 769 metres to 831 metres above sea level. Approximately 882 metres is the maximum elevation. Along the river in the northern part of the study is the lowest elevation of about 615 metres. The river valley is narrow, one to two kilometres wide, except to the south near Medicine Hat where the valley is approximately three to five kilometres wide. Apart from the small internal drainage basin of Many Island Lake, the South Saskatchewan River and its tributaries are the only major drainage system. Bowmanton Reservoir, Chappice Lake, Many Island Lake, Sam Lake, and Fifteen Mile Lake are the main year round water sources besides the river. Most of the intermittent sloughs dry up by late summer.

Soils

Soils of this area belong to the brown soil zone and the organic matter content is relatively low, however the natural fertility is adequate to produce good growth with sufficient moisture. A lime concentration, indicating a degree of leaching, can occur within twenty to forty centimetres of the surface. Most of the central portion of the study area is glacial loam. Approximately sixteen

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FIGURE 5 TOPOGRAPHY AND DRAINAGE

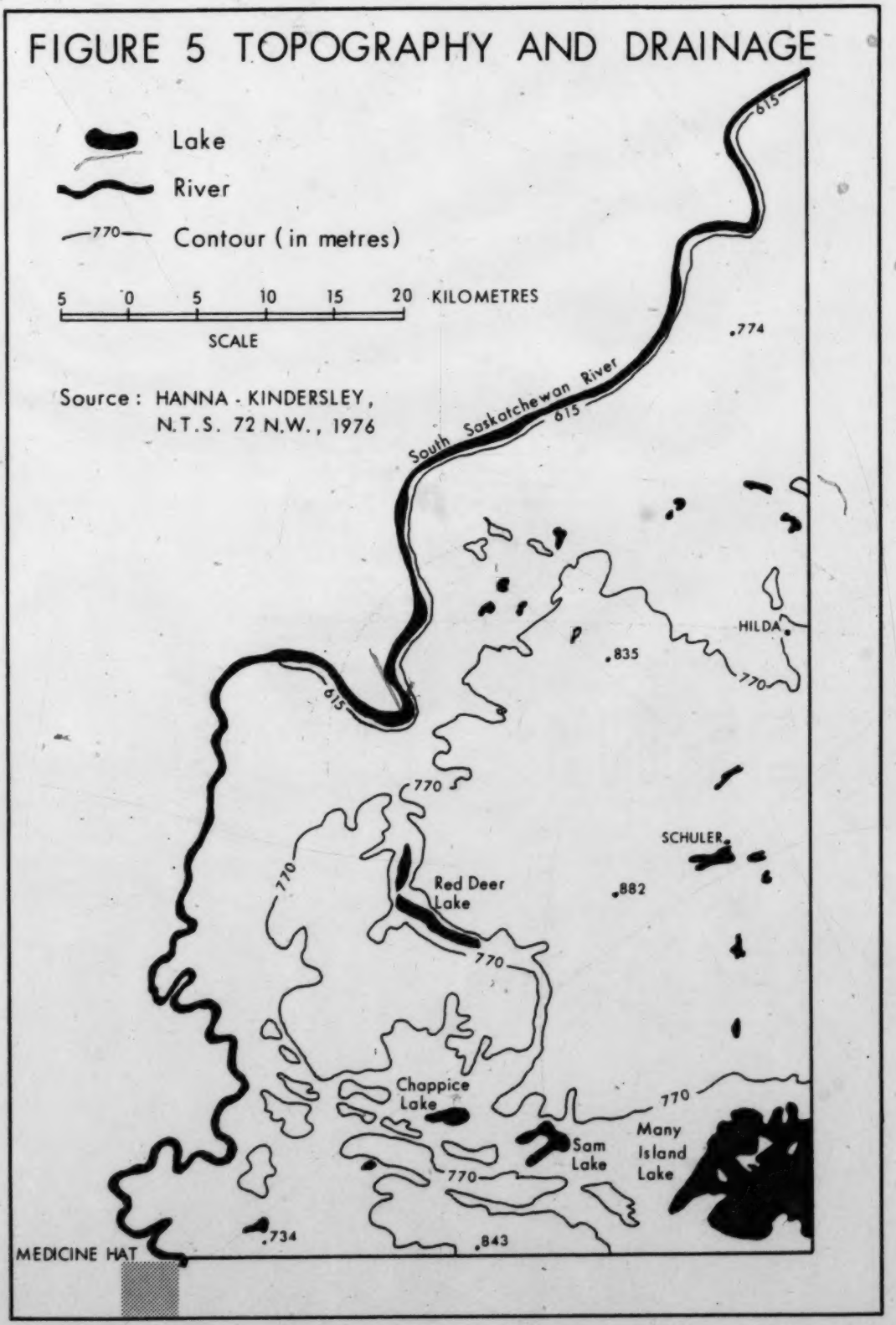

PLATE 1. Rolling Topography Near Chapice Lake Looking North

PLATE 2. Aerial View of Farmland on Level Topography

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kilometres north of Hilda, there is a small area of stabilized aeolian sand dunes. To the north a strip of alluvial soils have formed. Glaciofluvial fine sand and lacustine clay occur around Many Island Lake. The distribution of various soils is shown in FIGURE 6.

D. CLIMATE

This area has a semi-arid continental climate characterized by bright hot summers, and sunny, cold dry winter weather. The mean monthly temperature varies from approximately minus thirteen degrees Celsius in winter to twenty degrees Celsius in the summer with an average annual temperature of about 4.3 degrees Celsius. An average length of 100 to 120 frost free days gives this area the longest growing season in the Canadian Plains. An average annual precipitation ranges from twenty-seven to thirty-five centimetres which mostly comes in the form of rain during the summer months. High summer temperatures, 120 frost free days, a low annual precipitation, and frequent winds, produces a yearly soil moisture deficit of twenty to twenty-five centimetres mostly due to the high rate of evapotranspiration. Therefore, this semi-arid climate causes a severe limitation to crop growth.

Prevailing winds come from the west and southwest. Velocity varies from a monthly mean of 16.9 km/hr in August to 20.0 km/hr in April. Chinook winds, warm Pacific air masses being carried over the Rocky Mountains, sweep down on

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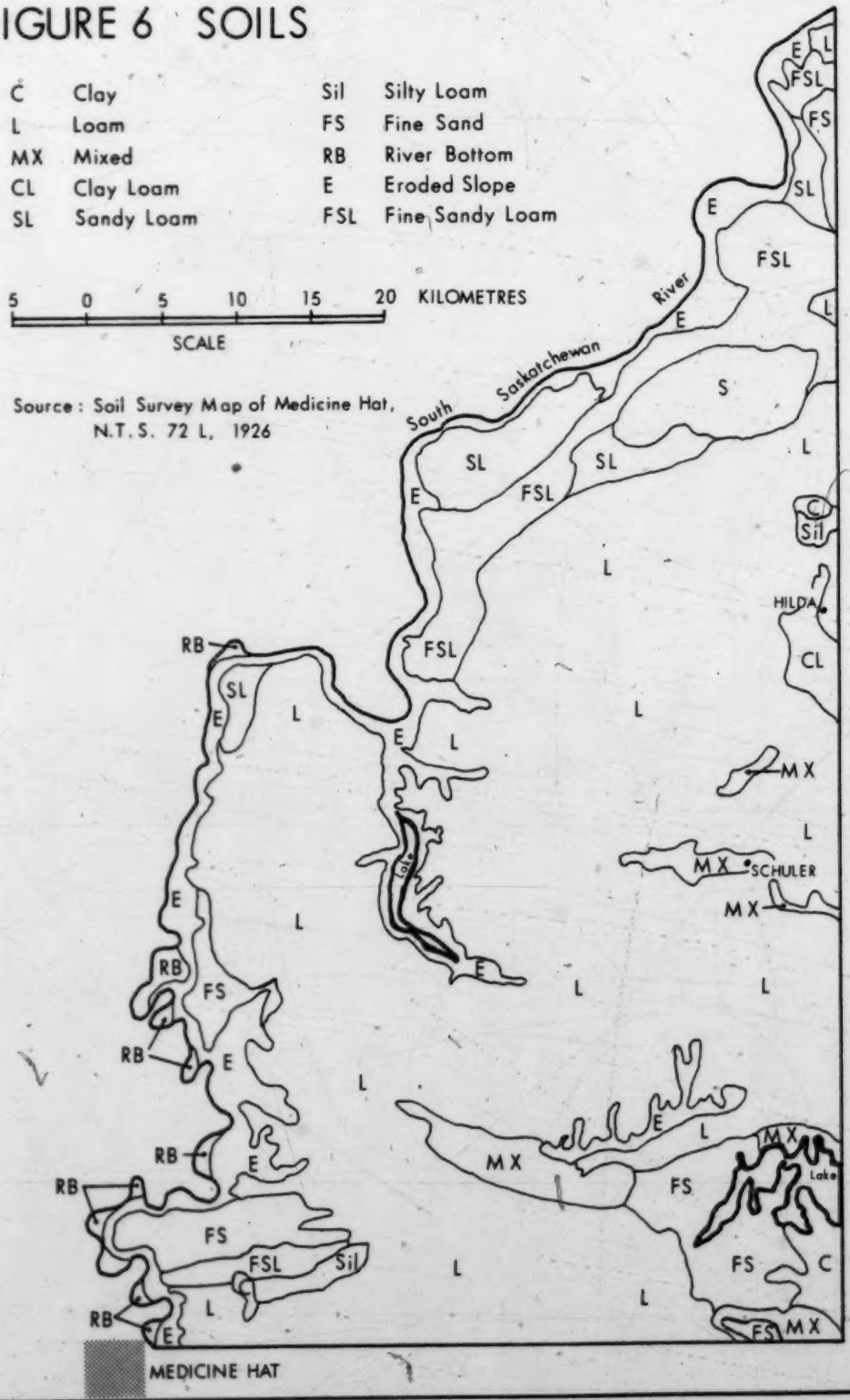
FIGURE 6 SOILS

C	Clay	Sil	Silty Loam
L	Loam	FS	Fine Sand
MX	Mixed	RB	River Bottom
CL	Clay Loam	E	Eroded Slope
SL	Sandy Loam	FSL	Fine Sandy Loam

5 0 5 10 15 20 KILOMETRES

SCALE

Source : Soil Survey Map of Medicine Hat, N.T.S. 72 L, 1926



to the prairies raising the temperature of cold winter days ten to twenty degrees Celsius, which also helps remove snow cover to permit winter grazing. Another winter weather phenomenon is the blizzard which brings blowing snow causing a potential hazard to livestock and other wildlife. Averages of temperature, precipitation, sunshine and wind for a twenty-five year period are presented in TABLE 2.

E. FLORA

Within the area of survey, the upland vegetation zone is a mixture of brush and short grass. Gramineous plants dominate the vegetation type. These characteristic short grass species are blue grama grass (Bouteloua gracilis), common spear grass (Stipa comata), June grass (Koeleria cristata), western wheat grass (Agropyron smithii), and Sandberg's bluegrass (Poa secunda). Some non-gramineous species of the short grass association are club moss (Selaginella densa), Wild rose (Rosa woodsii), prickly pear cactus (Opuntia polyacontha), cushion cactus (Mamillaria vivipara), and pasture sage (Artemisia frigida). Where alkali flats have developed, alkali grass (Distichlis stricta) grows. Although the vegetation is short and sparse, the exposed bare soil receives protection from erosion from the extensive root systems of these plants.

The vegetation in the coulee bottoms and along the river contrasts sharply with that of the prairie. Various species of trees and shrubs grow as the soils become moist

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TABLE 2

AVERAGES OF TEMPERATURE, PRECIPITATION, SUNSHINE AND WIND (1942-1967)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean of Daily Max. and Min. Temperature (^{o}C)	-12.9	-9.2	-4.6	5.2	11.4	15.4	19.7	18.3	12.7	7.2	-2.8	-8.7
Total Rainfall (cm.)	.03	.05	.08	.94	3.56	6.02	3.48	4.22	3.03	.84	.31	.05
Total Snowfall (cm.)	17.3	16.0	13.0	12.2	1.0	--	--	--	2.5	7.4	14.0	14.0
Total Precipitation (cm.)	1.70	1.52	1.37	2.13	3.66	6.02	3.48	4.22	3.38	1.60	1.68	1.45
Total Hours of Bright Sunshine	101.4	124.8	171.7	220.9	275.0	273.8	358.3	308.2	208.3	181.7	116.9	89.2
Mean Wind Speed (km/hr)	17.4	17.5	17.9	20.0	19.0	18.5	17.5	16.9	17.9	19.2	18.3	17.9

Source: Boswell, W.H. 1969. Climate of Suffield 1942-1967.
Ralston: Defense Research Establishment Suffield.

and more organic. Dominant species include buffalo berry (Shepherdia argentea), saskatoon berry (Amelanchier alnifolia), wolf willow (Eleagnus commutata), choke cherry (Prunus virginiana), and cottonwood (Populus sargentii). Other forms of aquatic and semi-aquatic vegetation are also present. Appendix A provides a general list of the flora in southeastern Alberta. PLATES 3, 4, 5 and 6 illustrate some of the various types of vegetation.

F. FAUNA

Although this semi-arid region appears to be unable to maintain an abundant wildlife, it does support a number of species of amphibians, birds, fish, insects, mammals and reptiles (see Appendix A). Even though the plains bison (Bison bison) no longer roams the plains, three species of ungulates -- the Rocky Mountain mule deer (Odocoileus hemionus), Dakota white-tailed deer (Odocoileus virginianus), and American pronghorn antelope (Antilocapra americana) -- continue to inhabit the region. Along with the herbivorous mammals there are several carnivorous mammals such as the prairie coyote (Canis latrans) and the pallid barred bobcat (Lynx rufus pallescens). Other mammals common to the river valleys and uplands are the rabbit, badger, beaver, skunk and various species of rodents. Rodents provide food for several varieties of snakes such as the prairie rattlesnake (Crotalus viridus) and the bullsnake (Pituophis catenifer).

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PLATE 3. Aerial View of an Unnamed Alkali Lake

PLATE 4. Example of Short Grass Vegetation Found Throughout Study Area

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PLATE 5. Grasses and Shrubs North of Hilda

PLATE 6. Brush in a Coulee Bottom

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Numerous frogs and toads prey upon an abundance of insect life. The clear-winged grasshopper (Camnula pellucida), Boxelder bugs (Leptocoris trivittatus), and mosquitoes (Aedes spp.) are readily devoured by resident and migratory birds. Sharp-tailed grouse (Pedioecetes phasianellus) frequent areas with tree and shrub vegetation. On the open prairie, the pot holes and sloughs provide an excellent habitat for waterfowl such as the Canada goose (Branta canadensis), ducks, and a multitude of shoreline species. Various species of mussels, suckers, minnows and sport fish can be found in the South Saskatchewan River. The main sport fish are northern pike (Esox lucius), goldeye (Hiodon alosoides), and walleye (Stizostedian vitreum). Lake sturgeon (Acipenser fulvescens), is the largest fish in the river.

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G. HISTORY OF THE STUDY AREA

Captain John Palliser travelled through southern Alberta during the dry years of 1850 to 1870, and proclaimed the region, later known as part of the 'Palliser triangle', unsuitable for farming. This was also the view of H.Y. Hind, commissioned by the Government of Canada in 1857-58 to report on the region of the Assiniboine and Saskatchewan Rivers. However, Professor John Macoun explored southern Alberta during the 1870's at a time when the area was experiencing a wet cycle, and reported that most of the short grass country was suitable for settlement (Putnam and

Putnam, 1970). With the Dominion Lands Act of 1882 and the Canadian Pacific railroad reaching Medicine Hat in 1883, the cattle ranching industry expanded quickly into the area. The Dominion Lands Act established regulations permitting twenty-one year leases for up to 100,000 acres (40,469 hectares) holdings with rent of one cent per acre per year. Within three years the lessee could purchase up to five percent of the leasehold for two dollars an acre if he met all the lease requirements. In 1886 the lease rental was raised to two cents per acre. Later, in 1896 new regulations were introduced which could terminate leases for the purposes of homesteading, pre-emption, or railway grants, but the ranchers were allowed to purchase ten percent of the leasehold for approximately one dollar and twenty-five cents per acre. The cattle industry was considerably reduced due to competition from homesteaders, drought, falling livestock prices, and the extremely severe winter of 1906-1907 destroying numerous cattle.

In approximately 1909 the homesteaders began arriving in the Hilda-Schuler area with the main influx in the decade 1911 to 1921. During this time there was bumper crops in 1915 and 1916, high war prices on wheat, and the introduction of the combine which increased the spread of farming. In 1923 the Canadian Pacific Railway constructed a spur line into the area.

From 1931 onward the rural population has steadily declined. However, the farms have become larger by absorbing

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some of the abandoned land, while the remainder returned to the Crown. Some factors causing the decline include: the drought and depression of the 1930's, low wheat prices, World War II, agricultural mechanization, the movement of many service functions from villages and small towns to larger centres, and the attraction of rural people to the city for employment or close proximity to improved service facilities. The population growth trend from 1901 to 1976 for the townships in the study area and some of southeastern Alberta's urban centres, is presented in TABLE 3. Between 1921 and 1976 there was a loss of 2,335 people in the study area. In contrast, the urban centres of the region have dramatically increased. The hamlet of Hilda has declined in population while the hamlet of Schuler indicated an increase between 1941 and 1976.

Today, the unincorporated hamlets of Hilda and Schuler (see PLATES 7 and 8) provide low order goods and services to essentially an agricultural community. Both Hilda and Schuler have the following facilities: a general store, a post office, a school, gas stations, grain elevators and churches. Also, Schuler has a curling rink and community hall, and Hilda has a hotel. Higher order goods and services are readily available in the city of Medicine Hat.

Wheat is the predominant crop while the main livestock is beef cattle. FIGURE 7 illustrates the deeded and leased land of the study area in 1977. The study area contains large cattle ranches, up to approximately 9,040 hectares in

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TABLE 3

POPULATION CHANGE

STUDY AREA TOWNSHIP	RANGE	1921 No.	1941 No.	1976 No.	POPULATION CHANGE 1921-1976 No.	%
13	1	78	18	4	-74	-95
13	2	94	97	35	-59	-63
13	3	124	105	34	-90	-73
13	4	94	48	9	-75	-80
13	5	111	89	68	-43	-39
14	1	19	15	6	-13	-68
14	2	49	42	21	-28	-57
14	3	89	50	27	-62	-70
14	4	51	9	0	-51	-100
14	5	25	19	22	- 3	-12
15	1	162	132	12	-150	-93
15	2	287	161	42	-245	-85
15	3	91	78	25	-66	-73
15	4	87	41	25	-62	-71
15	5	19	10	0	-19	-100
16	1	215	309	188	-27	-13
16	2	175	154	35	-140	-80
16	3	58	59	30	-28	-48
16	4	26	17	8	-18	-69
16	5	0	6	0	0	0
17	1	291	355	129	-162	-56
17	2	162	79	34	-128	-79
17	3	34	33	2	-32	-94
17	4	1	0	0	- 1	-100
17	5	15	8	0	-15	-100
18	1	319	204	45	-274	-86
18	2	256	146	119	-137	-54
18	3	82	26	16	-66	-80
19	1	103	60	27	-76	-74
19	2	24	0	0	-24	-100
19	3	8	6	0	- 8	-100
20	1	143	108	43	-100	-70
21	1	49	14	0	-49	-100
TOTAL		3,341	2,498	1,006	-2,335	-70
URBAN CENTRE						
MEDICINE HAT		9,634	10,571	32,811	+23,177	+241
REDCLIFF		1,137	1,111	3,006	+ 1,869	+164
BOW ISLAND		427	291	1,296	+ 869	+204
DUCHESS		92	149	343	+ 227	+247
IRVINE		356	240	221	- 135	- 38
EMPRESS		394	341	238	- 156	- 40
HILDA		na.	171	80	na.	na.
SCHULER		na.	113	121	na.	na.

Source: Statistic Canada, Population Census, 1921, 1946, 1976.
Note: 'na.' means not available.

PLATE 7. Aerial View of Schuler Looking East

PLATE 8. Aerial View of Hilda Looking Northwest

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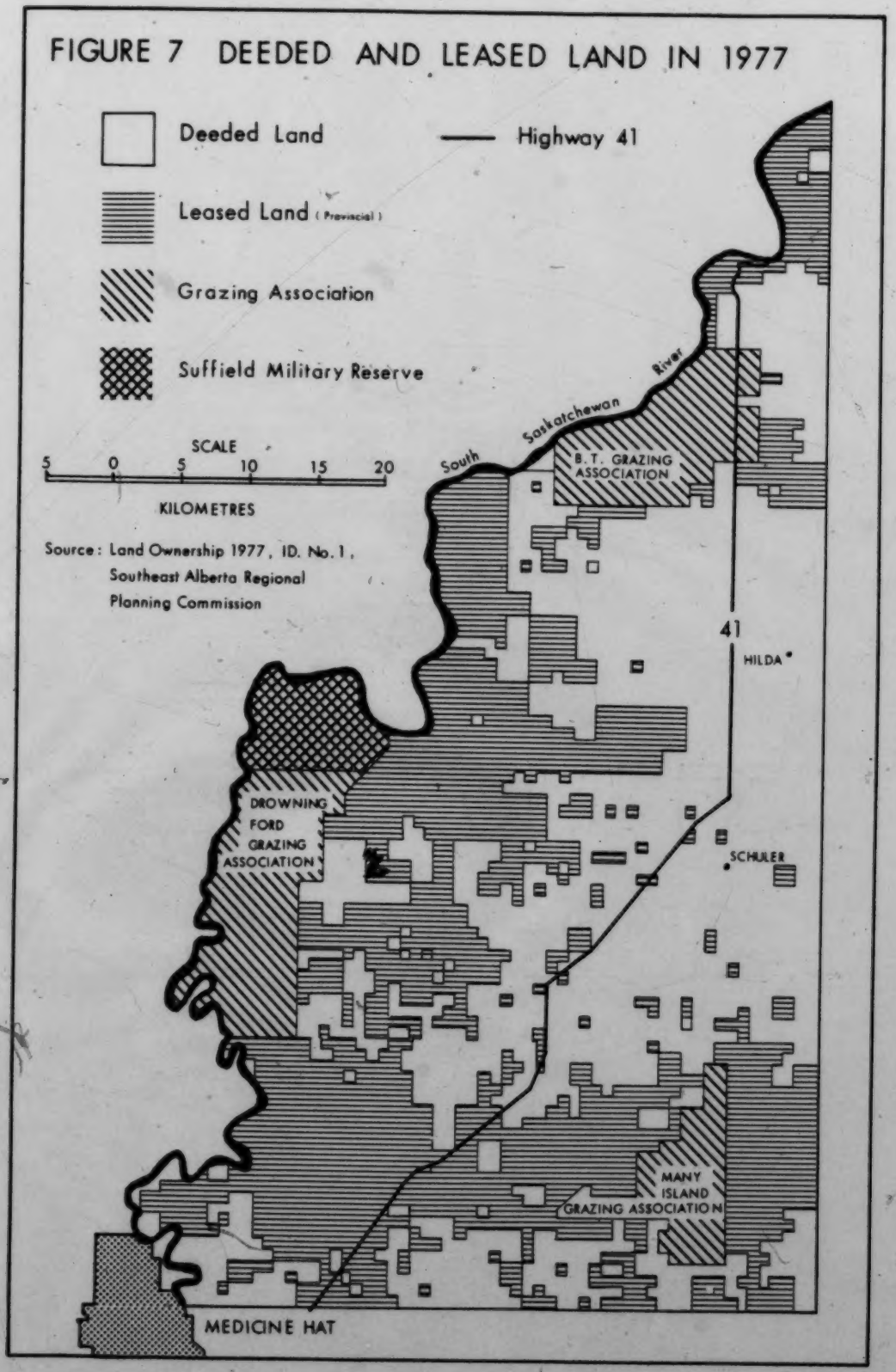
FIGURE 7 DEEDED AND LEASED LAND IN 1977
Deeded Land
Highway 41
Leased Land (Provincial)
Grazing Association
Suffield Military Reserve
SCALE
5 0 5 10 15 20
KILOMETRES
Source: Land Ownership 1977, ID. No. 1, Southeast Alberta Regional Planning Commission
South Saskatchewan River
B. T. GRAZING ASSOCIATION
41
HILDA
DROWNING FORD GRAZING ASSOCIATION
SCHULER
MANY ISLAND GRAZING ASSOCIATION
MEDICINE HAT

size, land which is mostly leased. Cereal farms range from about sixty-four hectares to 1,150 hectares most of which is owned. Some farmers grow crops and maintain livestock. One of the larger farm operations with both crops and livestock, had approximately 3,200 hectares of owned land and about 14,880 hectares leased.

Another industry within the study area is the extraction and production of natural gas. Two methane gas plants, owned by Dome and PetroCanada, are located in township twenty - range one. The majority of the employees reside in Burstall, Saskatchewan with company housing being available at the plant site and in Burstall. Numerous pipelines and pumping stations are scattered throughout the region. Accessibility to the gas plants, the farms, and the hamlets of Hilda and Schuler is provided by a paved, two-lane highway and a grid pattern of gravel roads. Highway 41 allows for good north-south movement.

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IV. CHAPTER FOUR

RESEARCH METHODOLOGY AND ATTITUDE THEORY

The methodology employed in collecting and analyzing the data, and a discussion on attitude theory are presented in this chapter. Farmland assessment sheets, tax assessment rolls, lease records, a rural directory, and a dropped-off, mail-back questionnaire were the principal sources of information. Questionnaire design and statistical methods used are also discussed. Since the questionnaire requests attitudinal and behavioural data, there is a discussion on the definition of attitude, the association between attitude and behaviour, and the measurement of attitudes.

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A. SOURCES OF DATA

Literature on the concept of farm fragmentation, and on the physical environment of the Hilda-Schuler area is readily available in published reports. Statistics Canada has generalized data on social and economic characteristics of farming, but they do not provide information for individual farms or farmers. To obtain social, economic, attitudinal and behavioural information on individual farmers and on their farming operation, five principal sources of data were used: farmland assessment sheets and tax assessment rolls from the Alberta Department of Municipal Affairs; lease records from the Alberta Department of Energy, Mines and Resources; the Medicine Hat and

District telephone directory; and a dropped-off, mail-back questionnaire. Field investigation was carried out in order to familiarize the writer with the study area.

B. THE RESEARCH POPULATION

The tax assessment records provided an excellent starting point in ascertaining the total number of farm units within the study area. These files contained an accurate list of individuals owning or leasing land, and the data was listed alphabetically and by township and range. Each entry gives the name and postal address of the individual being assessed, the number of acres owned or leased, land assessment and the tax payable. Each entry would usually only list the first two individuals who had an interest in that land, therefore the tax assessment computer files and government lease records were searched for individuals not listed. The telephone directory was used to confirm the addresses. The membership lists of the B.T. Grazing Association, the Drowning Ford Grazing Association, and the Many Island Grazing Association were also examined for individuals not listed in the tax assessment rolls. A total research population of three hundred and thirty-five farming units remained after all the duplications and non-farming categories were eliminated.[10] Examples of those excluded were: gas and oil companies, church organizations, and the Alberta Department of Highways and Transport.

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[10] The Hutterite colony within the study area was considered to be a single farm unit.

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C. QUESTIONNAIRE DESIGN

When choosing a method to collect data on a large number of scattered farm units, the dropped-off, mail-back questionnaire was preferred as opposed to personal interviews. This technique would be less expensive, easier to tabulate, easier to contact the population, require less time, provide uniform question presentation, reduce interviewee bias toward the interviewer, and allows the respondents to complete the questionnaire as slowly or rapidly as they please. However, this technique is not without limitations: low response rate, respondent prejudice against questionnaires, impersonalization, the researcher's inability to probe into replies, and error. Error can be attributed to any or all of the following: error due to non-response, questionnaire unreliability or lack of validity,[11] respondent unreliability or misunderstanding, and bias in the interpreting or coding the responses (Oppenheim, 1966; Berdie and Anderson, 1974). These difficulties can be considerably reduced by careful pre-testing and by statistical means such as the criterion of internal consistency.

---

[11] According to Berdie and Anderson (1974: 13), reliability is concerned with stability or consistency over time, that a person reading a question will interpret and respond to it the same way each time he reads it. Validity means that the respondent understands the question as it is understood by those conducting the research if the responses are to be valid.

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Based on farm fragmentation literature and preliminary interviews, a number of questions were collected and formulated into a preliminary questionnaire for pre-testing. Both a pre-test and the final questionnaire followed the guidelines recommended by Oppenheim (1966), Fishbein (1967), Summers (1970), Babbie (1973), and Berdie and Anderson (1974). Both questionnaires consisted of five sections. Section A was the Likert attitudinal measurement scale. Questions in Section B were on the farm operation, and on the socio-economic background of the farmer. Section C was answered by all respondents who leased or rented land in 1977. All respondents who owned land in 1977 were asked to answer Section D. The final page of the questionnaire, Section E, was a general section for comments and recommendations. See Appendix B for a copy of the finished questionnaire.

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Pre-test

The purpose of a pre-test is to reveal ambiguous, unnecessarily offensive, and irrelevant questions that may exist in the questionnaire. Pre-testing was first conducted on colleagues in the Department of Geography, a member of the Southeast Alberta Regional Planning Commission, and the district agriculturalist at Medicine Hat. Then, a sample of fifty farmers peripheral to the study area, to have respondents as similar as possible to those who would be receiving the final questionnaire, were tested. The following day the completed questionnaires were retrieved.

Respondents were asked for comments on format, and which questions needed clarifying. Several grammatical errors were indicated. Pre-testing was conducted during August and the first week of September, 1978.

Responses to the forty-six returned questionnaires were compiled and analyzed.[12] Some of the open-ended questions were reduced to closed-end questions. By using the criterion of internal consistency, the Likert attitudinal scale was checked for the proper assigning of numbers and to eliminate non-descriminating statements. Out of an original twenty-five attitude questions, only twenty-two were used in the final questionnaire. Attitude theory and the Likert attitudinal technique will be discussed later in this chapter.

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Final Questionnaire

An introductory letter and a stamped, addressed return envelope were included with the eight page final questionnaire.[13] (See Appendix B for the Introductory Letter.) The cover letter included: the nature of the study, who was requesting the data, auspices under which the study was conducted, how the data will be utilized, the confidentiality of the data, and mailing instructions (Babbie, 1973). To increase the response rate a self-addressed, stamped envelope was provided.

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[12]The other four questionnaires were not included because three were left at homes and the respondents were not at home at times of calling, and one was improperly completed.
[13] "Recent studies have shown that questionnaire length itself need not interfere with response rates" (Berdie and Anderson, 1974, page 61).

A dropped-off, mail-back technique was used to distribute the final questionnaire. The questionnaires were personally delivered to the respondents with the request that upon completion they be returned by mail. Each respondent was informed that a letter was enclosed explaining the purpose of the questionnaire. One hundred and eighty-seven farmers were contacted by this method during the month of October. Questionnaires were mailed to the farmers who were unavailable. All the non-respondents were mailed a follow-up letter (see Appendix B) to encourage a reply in order to increase the response rate.

Out of the entire research population of 335 farm units, a total of 155 (46 percent) questionnaires were returned of which eighteen were rejected due to incomplete answers. This brought the effective response rate to forty-one percent. The fifty-four percent which did not reply may bias the analysis of the returned questionnaires because those who replied may be a significantly unrepresentative portion of the population in terms of the characteristics being measured.

Some of the farmers returned their questionnaires blank with a reason for non-cooperation attached. Reasons given for nonresponse were: questions were too personal; do not have the time; was too complicated; and some refused because they thought it was associated with the government. Since farmers are frequently sent questionnaires, some farmers may have refused because they were tired and frustrated with

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answering questions. One farmer thought the questions were ridiculous. This type of comment was best illustrated in the Country Guide (see FIGURE 8).

D. METHOD OF ANALYSIS

Coding and Tabulation

The first step was to develop a coding manual to prepare the data from the returned questionnaires for computer analysis. A numerical value was assigned to each response category of each of the closed-ended questions. All coding, computer card punching and verifying were done by the author. Also, by using the Geography department's JOHN:CARDSCAN.O program, the data was checked again for improper card-punching. In the case of open-ended questions, they were compiled by hand. Each individual response for all the open-ended questions was recorded, and responses of a similar nature were grouped together.

The Statistical Package for Social Scientists (Nie et al, 1975), on the university's computer, was used to derive simple frequencies and descriptive statistics for all the variables, and cross-tabulations (contingency tables) for the identification of relationships between certain variables to answer research objectives and hypotheses mentioned in CHAPTER TWO. Chi-squared values, at the .05

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FIGURE 8 QUESTIONNAIRE REFUSAL BY FARMERS

"I'm taking a poll to determine what farmers do in their spare time."

Source: Country Guide, Vol. 97, No. 8, 1978, p. 30

level of significance, were used to test these relationships.[14] When using crosstabs, if twenty percent or more of the cells had expected values below five (cell depletion) then the significance of the association is questionable. Therefore, categories were grouped together to overcome the problem by increasing the number of cases per cell. The information obtained by this analysis is discussed in CHAPTERS FIVE and SIX.

Distances to Parcels

Several assumptions were made prior to determining the distances between the farmstead and the other parcels. These assumptions were:

1. Land consolidated farms required no road travel. This does not mean the farmer had not travelled on the road to reach a distant part of the farm but he had the option to remain on his land.
2. A direct link existed between corner touching parcels and the farmstead.
3. There were crossing points between barrier (road or rail) separated parcels and the farmstead, thereby making the amount of road travel negligible.
4. The farmer would take the shortest path to the parcels and did not cross fields operated by other farmers.

Distances between the farmstead and each detached parcel were measured along primary, secondary and locally improved roads. Origin and destination points were the two closest

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[14] For a discussion on the use of Chi-squared see Hubert M. Blalock, Social Statistics, 1972, pp. 275-287.

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corners of the farmstead and detached parcel. The corners choosen had to be adjacent to one of the above described roads.

E. ATTITUDE THEORY AND MEASUREMENT

Past and present attitudes and behaviour of individual farmers, or groups of farmers have and still are affecting the agricultural landscape. Farm operators make numerous managerial decisions based on political policies, market and societal pressures, and the perceived limits or potential of his environment. Since no man has perfect knowledge, he has to make judgements based on his beliefs or perceptions of possible courses of action available to him. Attitudes toward certain alternatives may affect his final choice. The attitudes and actual choice-making behaviour varies between individual farmers. This spatial dispersion of decision-making in farming is influenced by age, family size, job experience, farm income, education and other social and economic characteristics of the farm operator. By analyzing the psychological and socio-economic characteristics of the farmer, one may obtain a better understanding of the way the farmer develops his farm. Included in this section are the definition and components of attitude, functions of attitudes, the asociation between attitude and behaviour, and the measurement of attitudes.

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Defining Attitude

> "An attitude is a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related." (Allport, 1967, page 8)

People may have any number of attitudes about any number of issues. Attitudes are abstractions, some of which will be held in common with others while some will be held by a few (Calder and Ross, 1973).[15] An individual's attitude is a learned predisposition; that is, it may be acquired or modified by all or any number of the following: previous experiences, perceptions and knowledge of the individual; attitude inculcation by parents, peers, or reference groups; environmental contacts; impressionability of the individual; and prevailing social attitudes. When an individual is confronted with certain stimuli essentially quiescent attitudes are aroused, and he may respond in a favourable or unfavourable manner toward an attitude object (McGuire, 1968; Oskamp, 1977).[16]

Organization of Attitudes

Pyschologists agree that an attitude has three components: the cognitive component -- what an individual thinks about or believes; the affective or emotional component -- how an individual feels; and the behavioural or

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[15]Certain concepts closely allied to attitudes are: interest, motives, instincts, appreciations, tastes, mores, morality, morale, ideals, social distance, and character (Remmers, 1972, page 163).

[16]Attitude object refers to things, places, people, ideas or situations, either singular or plural (Oskamp, 1977, page 8).

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conative component -- the individual's behavioural or action tendencies toward an attitude object (Calder and Ross, 1973; Oskamp, 1977).[17] These three components may change over time at different rates and in different degrees.

The cognitive component comprises the ideas, beliefs, and factual information about an attitude object or how it is perceived to be (Calder and Ross, 1973). Some beliefs can be shallow and undergo multiple changes, while others can go much deeper and are fairly stable. They may be thought of as being structured into a vertical dimension, that is, one line of reasoning linking an underlying belief to a final conclusion, and/or a horizontal dimension, that is, multiple chains of reasoning leading to the same conclusion (Oskamp, 1977, page 59). Any number of beliefs, not necessarily related, may be contained in an attitude. In addition, beliefs can vary from unanimous social support to degrees of public dispute over the belief (Triandis, 1971).

Once a belief has been formed, it can acquire an evaluative or affective quality. An individual may evaluate a situation or object in a positive or negative direction with some degree of intensity or concern. Intensity may be thought of as a U-shaped magnet with the low part of the curve being the point of least intensity or indifference with respect to a particular attitude. This is also the point at which the attitude may change from positive to negative or vice versa. Progression up either the positive

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[17] Some theorists, for example McGuire (1968), disagree with differentiating any components of attitude.

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or negative sides represents the increasing strength with which an attitude is held. A person's attitudinal intensity may increase or decrease or even reverse polarity at different times or circumstances (Lemon, 1973, page 188).

The conative or behavioural component has an evaluative quality and an action tendency. Therefore, a behavioural aspect may have a positive or negative belief with an intention to act in a certain manner. However, the implicit behaviour or behavioural intent do not always coincide with actual behaviour. Actual behaviour refers to overt, motor or verbal action, toward or against the object or situation. Opinions, which are specific judgements on particular issues, are verbal or written expressions of an attitude or the result of many attitudes.

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Attitude Versus Behaviour

Although most social psychologists have agreed that attitudes have cognitions and affects, there still remains considerable controversy over the third component, the association between attitude and behaviour. Deutscher (1966), Wicker (1969), and Lauer (1971) examined studies on the attitude-behaviour relationship and they concluded that there was little or no association between them. However, the views of Fendrich (1967), Tittle and Hill (1967), and the recent review of the attitude-behaviour literature by Calder and Ross (1973), seem to indicate that there is at least a moderately good correspondence.

Behaviour can be influenced by a variety of causes of

which attitude is only one. Triandis (1971) considers behaviour to be a function of attitudes, norms, habits, and expectancies about reinforcement. He summarized their relationship when he stated:

> "Behavior is not only determined by what people would like to do but also what they think they should do, that is, social norms, by what they have usually done, that is, habits, and by the expected consequences of the behavior."
> "When all four factors are inconsistent there is much less consistency." (Triandis, 1971, page 14)

For example, the norms of behaviour established or expected by relatives, friends or acquaintances may differ, and therefore the individual's behavioural intentions may remain constant but the actual behaviour may differ to comply with different norms. Possible reasons for inconsistency between attitudes and behaviour are discussed in Wicker (1969), Fishbein and Ajzen (1975), and Oskamp (1977). Even though an individual's behaviour may be inconsistent with his attitudes, one is at least able to measure the current attitude which he is trying to make others believe that he has. Furthermore, studying attitudes allows one to include another variable in explaining the values, decisions and policies of individuals or groups. FIGURE 9 generally illustrates the relationship between stimulii, attitude, and behaviour.

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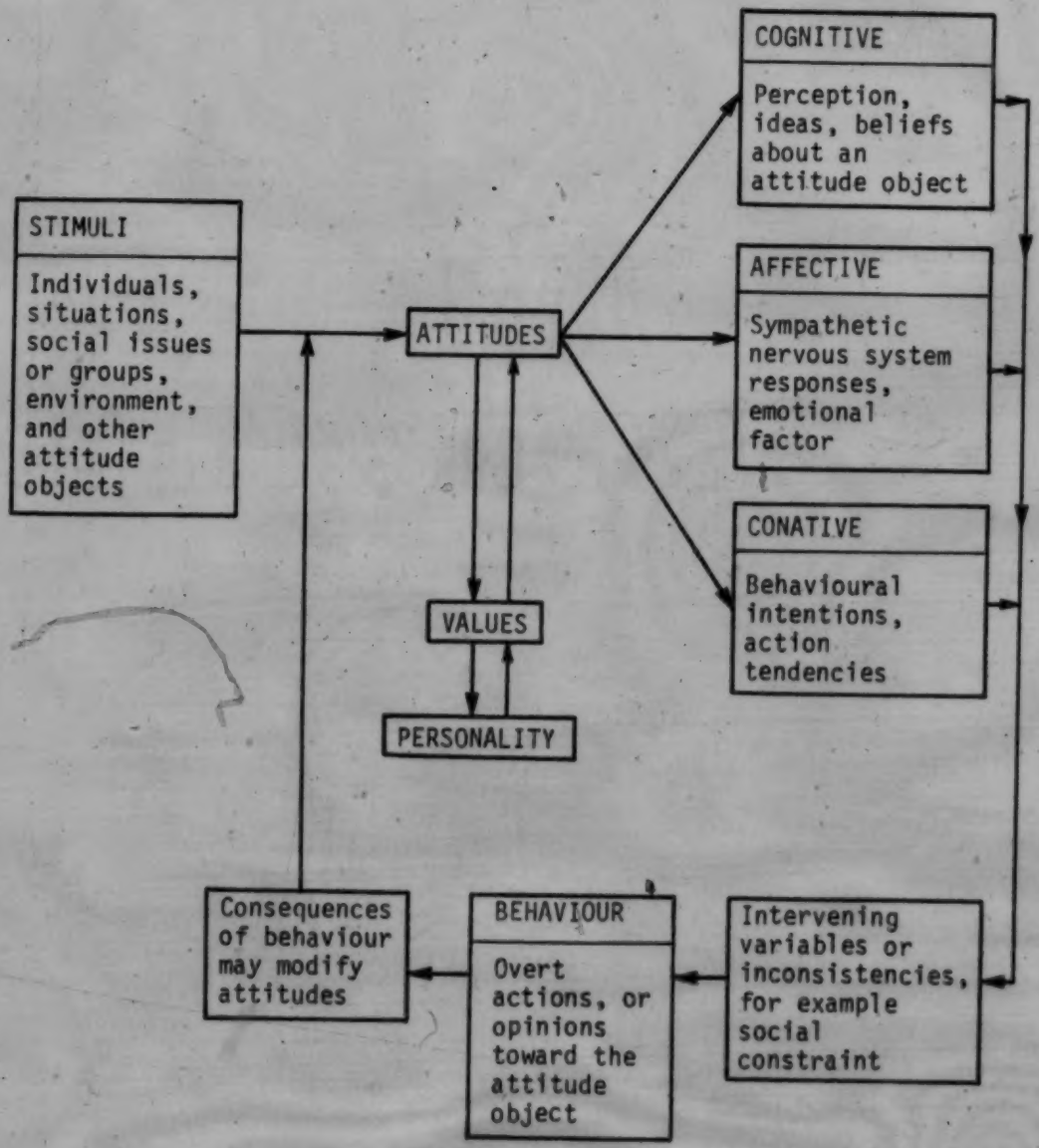
Functions of Attitudes

There are four functions that attitudes perform for the personality (Katz, 1960; Triandis, 1971; Oskamp, 1977). They are:

FIGURE 9 STIMULI, ATTITUDES AND BEHAVIOUR



Source: Adapted from Triandis, 1971, Attitude and Attitude Change; Calder and Ross, 1973, Attitudes and Behaviour; Oskamp et al., 1977, Attitudes and Opinions.

1. Adjustive-utilization functions

   Helping individuals to adjust in a complex universe by optimising rewards from the external environment and minimizing penalties.

2. Ego-defensive functions

   To protect self esteem, by making it possible to avoid acknowledging unpleasant truths about themselves.

3. Value expressive functions

   Allows one to express, through attitudes, one's fundamental values.

4. Knowledge functions

   To aid in understanding the complexities of one's universe by simplifying and giving structure to the complex systems.

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Attitude Measurement

Since the attitude-behaviour controversy is still unresolved, researchers may be inclined to follow Thurstone's (1968, page 78) comment of:

> "Neither his opinions nor his overt acts constitute in any sense an infallible guide to the subjective inclinations and preferences that constitute his attitude. Therefore, we must be content to use opinions, or other forms of actions, merely as indices of attitude."

Attitudes can be indirectly measured by the following methods: self-report measures, observation of overt behaviour, projection techniques, and physiological reactions. Self-reports are the most frequently used because of the ease of development and administration, and are usually less expensive. The other methods are less popular

because of limited areas of applicability, or unproven utility, and unknown validity and/or reliability (Oskamp, 1977, page 41) Due to these considerations, the self-report method was used in this thesis. Four of the most common self-report measures are: the scalogram analysis developed by Guttman, Osgood's semantic differential test, the Thurstone equal appearing interval scale, and Likert's summated rating scale.[18] These attitude scaling methods only present an indirect interpretation of the respondent's attitude by assessing his reply to written tests.

Due to the following considerations, the Likert method was used. Likert's technique, unlike Thurstone's equal appearing interval scale, is less time consuming, less laborious, provides more information because it has a five point judgement for each item statement, and eliminates the need for judges to rank the items. Using judges assumes that their opinions do not affect the scale values of the item statements. Furthermore, it is possible to obtain higher coefficients of reliability by the Likert method than by the Thurstone method (Fishbein, 1967). All four of the forementioned self-reporting techniques were compared by Tittle and Hill (1967), and they concluded that:

> "With respect to the assessment of alternative measurement strategies, the results indicate that there is a wide variation in the predictive power of the instruments. In this instance, the Likert was clearly the best predicter of behavior. It was the most highly associated with every one of the behavioral indexes." (page 210)

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[18]Fishbein (1967) and Oskamp (1977) provide a detailed desciption of these measuring instruments.

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Likert's attitude measurement scale requires the individual to place himself on a five point attitude scale for each statement. This freedom to indicate a level of agreement or disagreement creates the problem of lack of reproductability because the total score can be arrived at in different ways. Shaw and Wright (1967) pointed out that a score could be achieved by checking 'strongly disagree' for half the items and 'strongly agree' for the other half, by checking 'undecided' for all the items, or through some similar combination of agree-disagree responses. However, Fishbein and Ajzen (1975) indicate that the Likert scale yields quite high intercorrelations with other attitude measuring techniques.

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Likert Measurement Method

Likert scaling, developed by Rensis Likert in 1932, begins with a collection of opinion statements representing the subject matter under study. A set of statements are derived by consulting the literature and experts on the subject. Then an individual responds to each statement by checking one of five categories: strongly disagree, disagree, undecided, agree, and strongly agree.[19] They are assigned an integer value of one to five or five to one depending on whether the statement is positive or negative. Each opinion statement may be utilized as a single scale. Overall scores for the respondent are obtained by simple

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[19]"Ranking tells us nothing about the differences between ranks, ranking tells the order or sequence but the size of the rank intervals is unknown and unlikely to be equal." (Oppenheim, 1966, page 93).

summation of his scores for all the statements assuming they reflect the variable under consideration. Further discussion on this method can be found in Summers (1970), Lemon (1973), and Oskamp (1977).

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V. CHAPTER FIVE

ANALYSIS OF THE ATTITUDINAL AND BEHAVIOURAL VARIABLES

A. INTRODUCTION

Variations in attitudes and behaviour amongst one hundred and thirty-seven farmers are examined in this chapter. Cross-tabulations are used to identify relationships between twenty-two attitude statements and the farmers' socio-personal characteristics. In addition, the attitudinal responses of the farm fragmenters and non-fragmenters are compared. Chi-squared values, at the .05 significance level, are used to test these relationships. The attitude statements are on education, farm records, land ownership, renting, residence pattern, and risk and uncertainty in farming. Hypothesis one was defined as:

> The opinions, using Likert attitude measurement scales, of the farmers in the Hilda-Schuler district towards attitude statements will correlate a) positively with the greater the past farming experience, the higher the age grouping, farmers operating detached parcels, the greater the number of children, the higher the formal education level, and the greater the sources of information; and b) negatively with the higher the income level, and residency on the farm.

Behavioural questions examined include: the kinds and lengths of lease/rental agreements preferred, the reasons why tenants rent or lease instead of buying land, the reasons for having a non-farm residence, where the farmers shop for certain goods, their plans on buying and selling land, the reasons why the farmers have detached parcels,

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their willingness to consolidate their farm, and the distances farmers are willing to travel to obtain detached parcels.

B. GENERAL CHARACTERISTICS OF FARMERS

An individual's attitudes and decision-making processes can be related to personal attributes and socio-demographic characteristics. Some of these 'socio-personal' (Ibery, 1978) characterisics are: age, educational level, ethnic background, income level, marital status, number of children, past farming experience, sources of information utilized, and personal preferences. These social and personal factors are considered later in this chapter as variables which may be significantly associated with the farmers' opinions on particular attitude statements reflecting issues concerning agriculture and place of residence. Therefore, this section briefly describes the general characteristics of the farmers.

Socio-demographic Characteristics

The age groups, and the educational and income levels of the farmers are presented in TABLE 4. Only one independent farmer (0.7%) was under the age of twenty-five. This low percentage is possibly attributable to young farmers cooperating with their fathers to secure enough capital and land, especially when land values and interest rates are high, to start their own farm businesses. Most of the farmers (73.0%) were relatively evenly distributed

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TABLE 4

AGE GROUP, EDUCATION LEVEL, AND INCOME LEVEL OF THE FARMERS

AGE GROUP

Under 25	0.7%	35 to 44	23.4%	55 to 64	18.2%
25 to 34	22.6%	45 to 54	27.0%	Over 65	8.0%

N = 137 (100.0%)

EDUCATION LEVEL

Grades 1 to 6	9.8%	Some University/Technical College Courses	7.5%
Grades 7 to 9	39.8%	University Degree or Technical Diploma	3.8%
Grades 10 to 13	38.3%	Post Graduate Degree	0.8%

N = 133 (100.0%)
Missing Observations = 4

GROSS FAMILY INCOME IN 1977 (IN DOLLARS)

0 to 14,999	6.3%	75,000 to 89,999	4.5%
15,000 to 29,999	30.4%	90,000 to 104,999	0.9%
30,000 to 44,999	27.7%	105,000 to 120,000	0.9%
45,000 to 59,999	13.4%	Over 120,000	4.5%
60,000 to 74,999	11.6%		

N = 112 (100.0%)
Missing Observations = 25

Total Cases = 137

between the age groups of 25 to 34, 35 to 44, and 45 to 54. Eight percent were over 64 years of age while another 18.2 percent were in the semi-retirement category of 55 to 64 years. When comparing the farmers' educational level with age it appears that the younger farmers had more formal education. Eleven of the sixteen farmers with post secondary education were younger than forty-four years of age as compared to twelve of thirteen farmers over forty-five years of age with six or less years of schooling. A large concentration of seventy-eight percent of the farmers had between seven to thirteen years of schooling. Only four farmers refused to indicate educational level of which two were over sixty-four years of age with the others in the 35 to 44 and 55 to 64 age group.

In 1977 over fifty-eight percent of the one hundred and twelve farmers had a gross family income between 15,000 to 44,999 dollars and another twenty-five percent earned between 45,000 to 74,999 dollars. Of the eighty-four farmers with an income of less than 75,000 dollars, seventy-five were under fifty-five years of age. Three of the twelve farmers earning over 75,000 dollars were over the age of fifty-five years and had post-secondary education.

TABLE 5 reveals the family background of the respondents. Only seven (5.1%) farmers were single as compared to one hundred twenty-six (92.7%) farmers who stated that they were married (including separation). Approximately two percent of the farmers indicated that they

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TABLE 5

FAMILY BACKGROUND OF THE FARMERS

MARITAL STATUS

Single (never married)	5.1%	Widowed	1.5%
Married (incl. separation)	92.7%	Divorced	0.7%

N = 137 (100.0%)

NUMBER OF CHILDREN

Zero	10.4%	Three	24.4%	Six	1.5%
One	8.9%	Four	13.3%	> Six	2.2%
Two	32.6%	Five	6.7%		

Mean Number of Children = 2.6

N = 135 (100.0%)
Missing Observations = 2

ETHNIC BACKGROUND

German	74.5%	Dutch	1.4%
English	15.3%	French	0.7%
Scottish	5.9%	Norwegian	0.7%
Swedish	1.4%		

N = 137 (100.0%)

Total Cases = 137

were widowed or divorced, and over the age of fifty-five. The married and single farmers spanned all the age groups. The mean number of children in a family was three. Of the families with six or more children, two had six children, two had seven children, and one had twelve children.

The ethnic background of the farmers was predominantly German (74.5%) followed by English (15.3%). According to local histories of the Hilda and Schuler area, many residents or their descendents immigrated from settlements in south Russia near the Black Sea. Under the reign of Catherine the Great of Russia many Germans migrated from Germany to the Odessa and Bessarabia regions of Russia, however, as political unrest increased a large number of these farmers moved to Canada and United States. During the early 1900's the Hilda-Schuler district became settled with the German-Russian farmers and to a lesser degree by farmers from the United Kingdom.

Chi-square (x^2) goodness of fit tests were conducted to test the similarity or representativeness of the respondents to that of the total population (enumeration areas 12 to 15) and to the population of Improvement District Number One (See APPENDIX C). Four characteristics of the farmers were examined: age, educational level, ethnicity, and residence pattern. In all four tests a small chi-square value, below the specified rejection level, occurred indicating a good fit of the data.

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Experience, Information and Knowledge

As in the case of any individual, the attitudes of each farmer are acquired or modified by his previous experiences and knowledge, his contacts with the physical environment, and his sources of information. Responses to questions relating to how much knowledge and expertise were acquired on the farm, are presented in TABLE 6. Almost all the farmers (96.3%) were raised on a farm.

Only eleven (7.9%) respondents had farmed with relatives or others, while 68.6 percent had farmed with their fathers. Most (81.8%) had farmed on their own for an average of 19.6 years. One hundred eighteen of one hundred thirty-seven respondents indicated that they had farmed in the Hilda-Schuler area for an average of 23.5 years. Therefore, it appears that most had considerable experience and familiarity with the farming conditions in the Hilda-Schuler district.

An individual's perception of his physical and cultural environment partially depends upon the sources of information available, his awareness of what is available, and his ability to utilize that information. The questionnaire acquired data on the membership of organizations by families (TABLE 7) and on information sources which the farm tenants utilized (TABLE 8). Forty-five farm families belonged to one organization while another thirty-six families were members of two organizations. The remaining forty-seven families belonged

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TABLE 6

FARM EXPERIENCE OF THE FARMERS

GREW UP ON FARM			
Yes	96.3%	No	3.7%
N = 134 (100.0%)			
Missing Observations = 3			
HAVE FARMED WITH:			
Father	68.6%	Other Relatives	3.6%
On Own	81.8%	Others	4.3%
AVERAGE NUMBER OF YEARS OF FARMING EXPERIENCE			
Father	12.3	Other Relatives	13.0
On Own	19.6	Others	6.2
N = 126 (100.0%)			
Missing Observations = 11			
Total Cases = 137			

TABLE 7

ORGANIZATION MEMBERSHIP OF THE FARMERS

TO WHICH ORGANIZATIONS DOES YOUR FAMILY BELONG?	
4-H Club	9.5%
P.F.R.A.	25.5%
B.T. Grazing Association	19.7%
Many Island Grazing Association	7.3%
Drowning Ford Grazing Association	28.5%
Canadian Hereford Association	10.2%
Paterson Grain Company	10.9%
Alberta Wheat Pool	72.3%
Pioneer Grain Company	8.0%
United Grain Growers	2.2%
Others	20.4%

N = 129 (100.0%)
Missing Observations = 8

Total Cases = 137

TABLE 8

INFORMATION SOURCES OF FARM TENANTS

WHAT INFORMATION OR WHOSE ADVICE DO YOU SEEK OUT PRIOR TO MAKING A LAND LEASE/RENTAL AGREEMENT?

Lawyer	43.1%	Neighbour	8.3%
Family	38.9%	Bank Manager	2.8%
None	18.1%	Government Publication	2.8%
District Agriculturist	12.5%	Newspaper/Magazine/ Textbook	2.8%
Accountant	10.7%		

N = 72 (100.0%)
Missing Observations = 21

Total Cases = 93

Missing Cases = 44 (Farmers who were not tenants in 1977 did not answer this question.)

to three (23 families), four (16 families), and five (8 families) associations. The Alberta Wheat Pool had the highest percentage of memberships (72.3%). Five families were members of the Saskatchewan Wheat Pool which suggested some farmers owned or rented land in Saskatchewan. In the 'others' category, the following organizations were specified: Alberta Stock Growers, Alberta Charolais, Canadian Simmental, Canadian Limousin, Canadian Charolais, Unifarm, Ogilvies, the Hilda Community Association, and the Medicine Hat Co-operative Society. As expected, cattle associations and grain companies were the main types of organizations of interest to the farmers, because the main agricultural products of the Hilda-Schuler district are cattle, wheat, and barley.

As many as ninety-three of the one hundred thirty-seven questionnaire respondents indicated that land was rented or leased in 1977. It is of interest to examine what information and whose advice these farmers sought prior to making a land lease or rental agreement (TABLE 8). Thirteen farmers sought no advice or information. Family members were consulted by 38.9 percent of the farmers. The major source of advice was elicited from lawyers (43.1%). With the availability of provincial land for lease, it is surprising that few farmers (15.3%) consulted with the District Agriculturalist and/or government publications.

This section has described some of the socio-personal characteristics of the farmers. The farmers seem to vary in

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age, number of children, sources of information, and educational and income level; but only a few differ according to marital status, ethnic background, and farm experience. Since a farmer's attitudes and agricultural decisions are influenced by his socio-personal characteristics, the following section will compare the foregoing variables with particular attitude statements and behavioural variables in agriculture.

C. FARMERS' SOCIO-PERSONAL CHARACTERISTICS AND ATTITUDES

All the questionnaire respondents answered the twenty-two attitude statements concerning education, farm records, residence pattern, and other rural land tenure issues. These statements were cross-tabulated with the socio-personal variables. In all cases the associations were either statistically non-significant or were rejected due to many cells with an expected value below five. In TABLE 9, a summary of the farmers' responses to the attitude statements are presented. Other variables may have influenced the farmer's views, therefore the percentage of farmers responding to each statement are discussed. Under the section of rural land tenure, preferences for different lengths and types of rental/lease agreements are compared to opinions on renting/leasing land.

Formal Education and Farm Records

The farmers' opinions on formal education and maintaining farm records are presented in TABLE 10.

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TABLE 9

LIKERT ATTITUDE SCALE: A SUMMARY OF THE FARMERS' RESPONSES

ATTITUDE STATEMENTS	ABSOLUTE FREQUENCY				
	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. The owner has the right to sell his land for a profit.	75	57	4	0	1
2. Land is a community resource	11	40	30	44	12
3. The supply of land for farming in Alberta is unlimited.	2	19	10	74	32
4. Land ownership gives the freedom to farm the land without interference from government regulation	27	60	14	31	5
5. Renting land can free capital for other investments	6	80	27	23	1
6. City life is better than farm life	4	7	21	55	50
7. Inadequate leasing markets and agreements fail to put agricultural land into good use	8	46	56	25	2
8. Owned land is farmed more efficiently than rented land	15	54	9	59	0
9. Renting additional land can improve farm profits	17	109	8	3	0
10. A farmer with very little formal education can be a success today	9	70	13	42	3
11. With changing market prices, a farmer should have both crops and livestock to reduce the risk of financial loss	27	90	11	9	0
12. People rent land only when they lack the cash or credit to buy the land	10	31	12	77	7

TABLE 9 (Continued)

ATTITUDE STATEMENTS	ABSOLUTE FREQUENCY				
	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
13. Owning land means less money spent on land in the long run	7	53	39	36	2
14. Urban expansion on to rural agricultural land should be controlled.....	51	70	11	3	2
15. It costs more to operate a farm when you do not have a permanent farm residence	14	93	12	16	2
16. Foreign ownership of Alberta farmland should be controlled	73	52	7	2	3
17. Renting land causes uncertainty and the risk of not having land to farm.	18	90	14	13	2
18. Keeping records on your farm residence is a waste of time	1	5	6	78	47
19. The non-resident farmer farms the land as well as the resident farmer	3	53	15	57	9
20. The Provincial government should supply financial assistance to those who are just starting to farm	44	69	14	8	2
21. Hutterites should be allowed to purchase as much land as they want	1	6	15	40	75
22. Land ownership means certainty of having land to farm	26	99	6	6	0

N = 137 (100.0%)

TABLE 10

FARMERS' OPINIONS ON EDUCATION AND KEEPING FARM RECORDS

A FARMER WITH VERY LITTLE FORMAL EDUCATION CAN BE A SUCCESS TODAY.

Strongly Agree	6.6%	Disagree	30.9%
Agree	51.5%	Strongly Disagree	2.2%
Undecided	9.5%		

N = 137 (100.0%)

KEEPING RECORDS ON YOUR FARM RESIDENCE IS A WASTE OF TIME.

Strongly Agree	0.7%	Disagree	56.9%
Agree	3.7%	Strongly Disagree	34.3%
Undecided	4.4%		

N = 137 (100.0%)

Total Cases = 137

Approximately fifty-eight percent of the farmers thought that a farmer with very little formal education can be a success today. Although almost fifty percent of the farmers had less than grade ten education, there was no statistically significant relationship between the statement and their formal education level. A majority (91.2%) of the farmers disagreed with the statement 'keeping records on your farm residence is a waste of time'. Farm records provide the farmer with detailed information about his individual farm operation. In general, these farmers appeared to be in favour of keeping farm records and believed that farmers with little formal education can be a success today.

Government Regulations and Financial Assistance

Illustrated in TABLE 11 are the opinions of the farmers on government regulations and financial assistance. Most of the farmers were in favour of controlled urban expansion on to rural agricultural land and controlled foreign ownership of Alberta farmland. This latter view is interesting because temporary regulations on the foreign ownership of land in Alberta, passed on April 26th, 1977, were open to public comment at the time of the questionnaire survey. The Foreign Ownership of Land Regulations was proclaimed to be in force as of June 1st, 1979.

A majority (82.5%) felt that the Provincial government should supply financial assistance to those who are

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TABLE 11

ATTITUDES TOWARDS GOVERNMENT REGULATIONS AND FINANCIAL ASSISTANCE

	S.A. %	A. %	U. %	D. %	S.D. %	TOTAL %
Land ownership gives the freedom to farm the land without interference from government regulation ...	19.7	43.8	9.5	23.2	3.6	100.0
Urban expansion on to rural agricultural land should be controlled	37.2	51.1	7.3	2.9	1.5	100.0
Foreign ownership of Alberta farmland should be controlled	53.3	37.9	4.4	2.2	2.2	100.0
The Provincial government should supply financial assistance to those who are just starting to farm	32.1	50.4	9.5	6.5	1.5	100.0

N = 137 (100.0%)

Total Cases = 137

Legend: Strongly Agree (S.A.); Agree (A.); Undecided (U.); Disagree (D.); Strongly Disagree (S.D.).

beginning to farm.[20] In addition, 63.5 percent of the farmers believed that land ownership gives the freedom to farm the land without interference from government regulations. Thus, it appears that the farmers were in favour of certain government regulations and financial arrangements which were directly beneficial to them and at the same time want to retain the right to farm their owned land without government interference.

Land Tenure

There were twelve attitude statements reflecting issues concerning land tenure; five on land ownership, four on renting/leasing land, and three on risk and uncertainty in farming. The scores for the attitude statements are given in TABLE 12. Two questions concerning the kinds and lengths of lease or rental agreements which some of the respondents preferred, are discussed in relation to their attitudes on renting or leasing. In addition, the reasons why tenants rented or leased land instead of purchasing land is examined.

It is not surprising that in a country with a free enterprise system that most (96.4%) of the farmers responded with a capitalistic view by agreeing that the owner has the right to sell his land for a profit. Furthermore, eighty-four percent of the farmers were against the Hutterites, a communal society, purchasing as much land as

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[20]The provincial government does provide various forms of assistance to farmers. For more information see, A. Kaggwa and H. Warne, 1978, Assistance Available to Alberta Farmers, Alberta, Department of Agriculture, Edmonton.

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TABLE 12

FARMERS' ATTITUDES ON LAND TENURE ISSUES

	S.A. %	A. %	U. %	D. %	S.D. %	TOTAL %
LAND OWNERSHIP						
The owner has the right to sell his land for a profit	54.8	41.6	2.9	0.0	0.7	100.0
Hutterites should be allowed to purchase as much land as they want	0.7	4.4	10.9	29.2	54.8	100.0
Land is a community resource	8.0	29.2	21.9	32.1	8.8	100.0
Owning land means less money spent on land in the long run	5.1	38.7	28.5	26.3	1.4	100.0
Owned land is farmed more efficiently than rented land	10.9	39.4	6.6	43.1	0.0	100.0
RENTING/LEASING LAND						
Renting land can free capital for other investments	4.4	58.4	19.7	16.8	0.7	100.0
Renting additional land can improve farm profits	12.4	79.6	5.8	2.2	0.0	100.0
People rent land only when they lack the cash or credit to buy the land	7.3	22.6	8.8	56.2	5.1	100.0
Inadequate leasing markets and agreements fail to put agricultural land into good use	5.8	33.6	40.9	18.3	1.4	100.0

TABLE 12 (Continued)

	S.A. %	A. %	U. %	D. %	S.D. %	TOTAL %
RISK AND UNCERTAINTY						
Renting land causes uncertainty and the risk of not having land to farm	13.2	65.7	10.2	9.5	1.4	100.0
Land ownership means certainty of having land to farm	19.0	72.2	4.4	4.4	0.0	100.0
With changing market prices, a farmer should have both crops and livestock to reduce the risk of financial loss	19.7	65.7	8.0	6.6	0.0	100.0
N = 137 (100.0%)						

Total Cases = 137

Legend: Strongly Agree (S.A.); Agree (A.); Undecided (U.); Disagree (D.); Strongly Disagree (S.D.).

they want. One farmer commented that once the Hutterites own the land there is a low probability of it returning to the open market. There was almost an evenly divided response to the remaining three statements relating to land ownership. Different interpretations on the statement about 'land is a community resource' may have caused a difference of opinion. Some farmers may have considered the term 'community resource' implied an infringement upon private rights to land ownership while others may not have held this view. For example, farmers may have believed 'community resource' meant the land would be owned by the government or that it implied the individual farmers worked together to improve the agricultural resources of the community. Inflationary land prices and interest rates might partially explain the farmer's indecision about whether or not owning land means less money spent on land in the long run. Upon closer examination the difference of opinion on the statement on farm efficiency was not between tenants and land owners.

A total of fifty-four out of one hundred thirty-four farmland owners stated that they rented some or all of their land prior to ownership (Question 8, section D of questionnaire).[21] Renting land is one means of accumulating sufficient capital to purchase more land. According to the attitude statements, the renting of land seemed to be thought of as a means of increasing farm profits, freeing capital for other investments and was not always a result of

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[21] Land rented includes land under crown grazing leases as well as land rented from private owners.

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inadequate finances. Several farmers indicated that the statement on inadequate leasing markets was ambiguous which may explain the large number (40.9%) of undecided responses. For example, one farmer indicated that the term 'leasing markets' was rather vague.

Although there appeared to be a positive attitude towards the financial aspects of renting by many (over sixty percent) of the farmers, there was a difference of opinion on the risk and uncertainty associated with renting. With renting land there is the problem of tenure insecurity. The security of land ownership was evident by the farmers' opinions on the two attitude statements reflecting issues of risk and uncertainty in renting land (TABLE 12).

Another area of uncertainty is the market price for farm products. With fluctuating market prices, a farmer with both crops and livestock can reduce the risk of financial loss. Over eighty-five percent of the farmers agreed with this particular idea. With crops and livestock a farmer can spread the risk of financial loss due to an environmental hazard, such as hail storms destroying an entire crop.

Since the farmers reflected some concern over the risk and uncertainty associated with renting/leasing land, it is of interest to examine what kinds and lengths of lease/rental agreements were preferred (TABLE 13) and what actually existed. Only the farmers who rented or leased land in 1977, approximately sixty-eight percent of all the respondents, were asked about their preferences.

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TABLE 13

KINDS AND LENGTHS OF RENTAL AGREEMENTS PREFERRED

KIND PREFERRED	%	LENGTH PREFERRED	%
Crop-share	64.1	1 year	1.4
Straight-cash	22.4	2-5 years	21.1
Livestock-share	6.0	6-10 years	29.6
Flexible cash	4.5	>10 years	47.9
Combination cash and share	3.0		
N = 67 (100.0%) Missing Observations = 26		N = 71 (100.0%) Missing Observations = 22	

Total Cases = 93

Missing Cases = 44 (Non-Tenants did not answer these questions.)

Crop-share agreements were preferred by most (64.1%) respondents, followed by 22.4 percent who selected straight cash agreements, and only a few (13.5%) chose the other agreements. Even though eighty-four of the ninety-three tenants had public grazing agreements or belonged to a private grazing association, only four farmers preferred a livestock-share agreement.

Most (47.9%)of the farmers preferred long term agreements of greater than ten years with a decreasing number choosing six to ten years (29.6%), two to five years (21.1%), and one year (1.4%) agreements. Among the reasons given for the greater than ten year agreements were: ability to plan ahead, to protect improvements or investments, security of income, and family goals. Planning for equipment purchases without gambling on the size of the farm was another reason. A couple of farmers stated that the two to five year agreements were long enough to provide some security but short enough to change future plans. Of the reasons given, security and planning ahead were the most common responses which seem to coincide with the farmers concern over risk and uncertainty in the attitude statements.

Approximately seventy percent of the tenants had public grazing leases and/or permits. Grazing leases are available for terms five, ten or twenty years, while grazing permits are issued yearly and on both types of agreements the lessee pays rental fees, a percentage of the forage value of the

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lease, to the province. These agreements are written and renewable. Of the thirty-seven tenants that reported private agreements, twenty-eight provided data on the agreements. Over half of the private agreements were verbal (53.6%) and renewable (57.1%). Most (85.7%) of the private agreements were crop-share of which seventy-nine percent were one-half or two-thirds share to the tenant. In addition, one flexible cash and one share-cash agreement were reported. Only seventeen tenants stated the lengths of the private agreements; one year (23.5%), two to five years (29.4%), six to ten years (11.8%), and greater than ten years (35.3%).

Tenants were asked why they rented or leased land instead of purchasing land (TABLE 14). The most common reason (54.4%) given for renting/leasing was that the land was not for sale. This may be one reason why the farmers responded with disageement to the attitude that people rent land only when they lack the cash or credit to buy the land. Comments such as high land prices, high interest rates, and it is cheaper to rent or lease, might partially explain why some farmers disagreed or were undecided on whether owning land means less money spent on land in the long run (TABLE 12).

Farm Residence Issues and the Supply of Farmland in Alberta

The four remaining attitude statements concern the supply of farmland in Alberta (TABLE 15) and farm residence issues (TABLE 16). Apparently a majority (77.4% and 76.7% respectively) of the farmers disagreed that the supply of

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TABLE 14

RENTING OR LEASING LAND INSTEAD OF BUYING LAND

REASONS FOR RENTING OR LEASING INSTEAD OF BUYING	%
Rented/leased land is not for sale	54.4
Land prices are too high	22.8
Rented/leased land was available	10.5
It is cheaper to rent/lease	5.3
High interest rates on borrowed money	3.5
Need it for grazing purposes	3.5

N = 57 (100.0%)
Missing Observations = 36

Total Cases = 93

Missing Cases = 44

TABLE 15

FARMERS' ATTITUDE TOWARD THE SUPPLY OF FARMLAND IN ALBERTA

THE SUPPLY OF LAND FOR FARMING IN ALBERTA IS UNLIMITED.

Strongly Agree	1.4%	Disagree	54.0%
Agree	13.9%	Strongly Disagree	23.4%
Undecided	7.3%		

N = 137 (100.0%)

Total Cases = 137

TABLE 16

FARMERS' OPINIONS ON FARM RESIDENCE ISSUES

CITY LIFE IS BETTER THAN FARM LIFE.

Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
2.9%	5.1%	15.3%	40.2%	36.5%

N = 137 (100.0%)

IT COSTS MORE TO OPERATE A FARM WHEN YOU DO NOT HAVE A PERMANENT FARM RESIDENCE.

Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
10.2%	67.9%	8.8%	11.7%	1.4%

N = 137 (100.0%)

THE NON-RESIDENT FARMER FARMS THE LAND AS WELL AS THE RESIDENT FARMER.

Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
2.2%	38.7%	10.9%	41.6%	6.6%

N = 137 (100.0%)

Total Cases = 137

land for farming in Alberta is unlimited and that city life is better than farm life. Approximately seventy-eight percent considered it costs more to operate a farm without a permanent farm residence. On the statement of whether the non-resident farmer works the land as well as the resident farmer there was a difference of opinion with 40.9 percent agreeing and 48.2 percent disagreeing. The following section will examine if the farmer's residential location had any bearing on his opinion toward the attitude statements.

D. FARMERS' ATTITUDES AND FARM FRAGMENTATION

Fragmented farms occured in 127 out of the 137 farm operations either by fragmenting the residential location and/or the farmland. Almost three-quarters (73.8%) of the farmers lived on the farm for eleven to twelve months of the year, while seven (5.1%) farmers were seasonal residents (less than seven months on the farm), and twenty-nine (21.1%) farmers did not reside on the farm. At least eighty-one percent of the farmers operated a farm with fragmented land of which seventy-eight percent had detached parcels. Therefore, the responses to the attitude statements are compared with the farmers' residential pattern and whether or not the farms had detached parcels. Responses to questions on why the farmers had a non-farm residence, and on their shopping behaviour will be investigated.

Attitudinal Responses by Farm Fragmentation

All the attitude statements were cross-tabulated with

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the farmers' residence pattern and whether or not the farms had detached parcels. This resulted in no relationships at the .05 significance level. Shown in TABLE 17 are the responses by resident, seasonal resident and non-resident farmers to four attitude statements in which minor differences in opinion were evident. Many of the non-resident farmers agreed that land is a community resource while more seasonal and resident farmers disagreed than agreed. On attitude statements number eight and thirteen concerning land ownership, the resident farmers were evenly split between agreement and disagreement while more of the seasonal and non-resident farmers were in agreement. Attitude statement nineteen was only one of three opinion statements about residential concepts which had a small opinion difference. Slightly more non-resident farmers agreed with the attitude statement that the non-resident farmer farms the land as well as the resident farmer, while a larger number of the seasonal residents and resident farmers disagreed with the statement.

Reasons for Non-farm Residences and Farmers' Shopping Behaviour

Presented in TABLE 18 are the reasons for the farmers living in non-farm residences. Six resident farmers owned houses off the farm and the most common reason was for future investment. Both the seasonal and non-farm residents indicated semi-retirement and the school needs of the children as reasons. One farmer, over sixty-five years of

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TABLE 17

FARMERS' RESIDENTIAL PATTERN AND

ATTITUDE STATEMENTS TWO, EIGHT, THIRTEEN AND NINETEEN

	RESIDENT			SEASONAL			NON-RESIDENT		
Attitude Statement	Agr. No.	Und. No.	Dis. No.	Agr. No.	Und. No.	Dis. No.	Agr. No.	Und. No.	Dis. No.
2	32	26	43	2	0	5	17	4	8
8	46	7	48	4	1	2	19	1	9
13	37	33	31	4	2	1	19	4	6
19	39	13	49	2	0	5	15	2	12
	N = 101 (100.0%)			N = 7 (100.0%)			N = 29 (100.0%)		

Total Cases = 137

Legend: 2. Land is a community resource

8. Owned land is farmed more efficiently

13. Owning land means less money spent on land

19. The non-resident farmer farms the land as well

TABLE 18

REASONS FOR HAVING A NON-FARM RESIDENCE

NON-FARM RESIDENT		SEASONAL RESIDENT		RESIDENT FARMER	
Reasons	%	Reasons	%	Reasons	%
Close to off-farm employment	39.1	School needs of children	40.0	Future Investment	50.0
Semi-Retired	13.0	Semi-retired	20.0	Resort House in British Columbia	16.6
The farmland is rented	8.7	Too lonely and isolated on farm	20.0	Future Retirement	16.6
School needs of children	4.4	No drinking water on farm	20.0	House is rented out for income	16.6
Lack of services on farm	4.4				
Health and Age	4.4				
Deterioration of the farmhouse	4.4				
No house on farm	4.4				
Farm unable to support family	4.4				
Land is straight crop with no pasture	4.4				
To move to the city	4.4				
A place to live	4.4				
N = 23 (100.0%)		N = 5 (100.0%)		N = 6 (100.0%)	
Missing Observations = 6		Missing Observations = 2		Missing Observations = 95*	

Total Cases = 137

*The 95 missing observations were resident farmers who did not have a non-farm residence.

age, stated that "when the local school was closed and the children were bussed to Burstall, Saskatchewan, he left the farm, as did nearly all the farmers in the Sandy Point School District, to educate their children in Alberta." Closeness to non-farm employment was the main reason (39.1%) why the non-farm residents chose to live off the farm. School needs, employment opportunities and the lack of services on the farm were responses by the seasonal and non-farm residents which suggest that they wanted to take advantage of services offered in an urban centre.

The associations between the farmers' residence pattern and their age (TABLE 19) and their gross family income level (TABLE 20) were statistically significant at the .05 level of significance. As the farmers' age increased the percentage of resident farmers declined but conversely, as the family income level increased the percentage of resident farmers increased as compared to the non-farm residents.

Another reason why farmers moved to an urban centre is the availability and variety of goods offered for sale. The respondents were asked where they purchased certain goods (TABLE 21). Only stores selling clothing or furniture were absent from Hilda and Schuler. A slightly higher percentage of farmers bought gas and oil in either Hilda or Schuler (45.5%) than in Medicine Hat (43.3%). Farm machinery seemed to be purchased in many different locations, possibly due to the farmers shopping around for the best deal on such a large expense. This included shopping in nearby centres in

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TABLE 19

RESIDENCE PATTERN BY AGE GROUP

RESIDENCE PATTERN	AGE GROUP UNDER 34 %	35-54 %	OVER 54 %	TOTAL %
RESIDENT	100.0	76.6	62.5	78.6
NON-FARM RESIDENT	0.0	23.4	37.5	21.4
TOTAL	N=30 (100.0%)	N=64 (100.0%)	N=32 (100.0%)	N=126 (100.0%)

Missing Observations = 11
Chi-squared = 13.24; d.f. = 2; $p < .0013$

TABLE 20

RESIDENCE PATTERN BY FAMILY INCOME

RESIDENCE PATTERN	GROSS FAMILY INCOME (IN DOLLARS) 0-29,999 %	30,000-59,999 %	60,000->120,000 %	TOTAL %
RESIDENT	65.8	78.0	95.8	77.7
NON-FARM RESIDENT	34.2	22.0	4.2	23.3
TOTAL	N=38 (100.0%)	N=41 (100.0%)	N=24 (100.0%)	N=103 (100.0%)

Missing Observations = 34
Chi-squared = 7.66; d.f. = 2; $p < .022$

TABLE 21

PLACE OF PURCHASE OF SPECIFIC CONSUMER GOODS

PLACE OF PURCHASE	TYPE OF PURCHASE						
	Weed & Livestock Sprays %	Gas & Oil %	Farm Machinery %	Fertilizer %	Groceries %	Clothing %	Furniture %
Hilda	10.2	21.6		12.8	6.0		
Schuler	17.2	22.4	6.0	16.3	2.3	0.7	
Medicine Hat	43.0	43.3	54.9	56.9	58.6	85.2	91.9
Hilda & Medicine Hat	9.4	3.7	1.5	7.0	13.5	2.2	
Schuler & Medicine Hat	11.7	1.5	26.3	4.7	11.3	1.5	
Hilda & Schuler	3.1	1.5	1.5				
Others	5.4	6.0	9.8	2.3	8.3	10.4	8.1
Locations:	Burstall* Irvine	Calgary Edmonton Burstall*	Brooks Burdett Burstall* Leader* Maple Creek* Oyen Richmond* Taber	Richmond* Burstall*	Calgary Edmonton Burstall*	Calgary Edmonton Lethbridge Brooks	Calgary Edmonton Lethbridge
	N = 128 (100.0%) M.O.=9	N = 134 (100.0%) M.O.=3	N = 133 (100.0%) M.O.=4	N = 86 (100.0%) M.O.=51	N = 133 (100.0%) M.O.=4	N = 135 (100.0%) M.O.=2	N = 135 (100.0%) M.O.=2

Total Cases = 137

Notes: Places with an asterisk are in Saskatchewan.
: Some ranchers may not use fertilizer.

Saskatchewan. An added advantage is that the farmers are exempt from a sales tax on farm machinery.

In general, it appeared that many of the farmers, at least forty-three percent, purchase certain goods mainly in Medicine Hat which was the closest major centre. Since the city was within an hour's drive for most resident farmers, they may have wished to reside on the farm for the advantages of country life, and travel to the city for the necessary goods and services.

E. FARM ENLARGEMENT AND LAND AVAILABILITY

When a farmer wants to enlarge his farm he is confined to land which is available or offered for sale at an affordable price, and this land may not be adjacent to his property. Therefore, the farmer was asked about future plans for farm expansion, selling of land, and the reasons for having detached parcels instead of land adjacent to the farmstead.

Future Plans for Farm Expansion

As shown in TABLE 22, 73.8 percent of the farmers were willing to expand their operation in the future if the opportunity arose. The main reasons given by those wanting to expand were: a desire to provide a farm for their children, a concern about farm profits and costs, and a belief that land is a good investment. Being too old or considering retirement from farming accounted for sixty-three percent of the thirty-four farmers who did not

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TABLE 22

FARMERS' WILLINGNESS TO EXPAND THEIR OPERATION

WOULD YOU BE WILLING TO EXPAND YOUR OPERATION IN THE FUTURE IF THE OPPORTUNITY AROSE?

YES 73.8%

REASONS	%
To provide a farm for the children	29.2
To make the farm more profitable	18.5
To maintain a more viable operation	15.4
Land is a good investment	12.3
Due to the cost of machinery	6.2
To cover rising costs	6.2
Would like to have more pasture land	4.6
Present prices of grain	3.1
Better than working for someone else	1.5
To make farming sole income	1.5
Have large machinery	1.5

N = 65 (100.0%)
Missing Observations = 31

NO 26.2%

REASONS	%
Too old or retiring	62.9
Have large enough operation	11.1
Would have to hire extra help	11.1
Not interested	7.5
Want to improve present land production	3.7
Not enough money	3.7

N = 27 (100.0%)
Missing Observations = 7

N = 130 (100.0%)
Missing Observations = 7

Total Cases = 137

intend on expanding their farm. The association between the farmers' age and their willingness to expand their operation was significant at the .001 level of significance. Farmers under the age of fifty-five (85.3%) were twice as willing to expand as those (42.9%) over fifty-five years. As farm expansion can include farm intensification as well as enlargement, it was important to ask which farmers were looking for additional land.

Farmers' Search for Additional Land

TABLE 23 sets forth the responses given by farmland owners on whether they were looking for additional land to own, and to rent/lease; and if so, how many hectares. Out of one hundred nineteen responses, a total of twenty-one farmers wanted both land to own and to rent/lease as compared to forty-three who wanted neither; and forty-nine who wanted owned land but no rented/leased land as compared to six who wanted rented/leased land but no owned land. In total, seventy-six farmers indicated that they were seeking additional land. This was twenty farmers less than those willing to expand their operation.

The association between the farmers' age and whether they were looking for additional land to own was significant at the .002 level of significance. Twice as many farmers under the age of fifty-five years (71.1%) as compared to those over fifty-five (35.5%), were searching for additional land to own.

Cross-tabulations between the farmers' present farm

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TABLE 23

FARMERS' LOOKING FOR ADDITIONAL LAND

PRESENT FARM SIZE (in hectares)	DESIRE FOR ADDITIONAL LAND: TO OWN				TO RENT OR LEASE			
	No %	Yes %	Hectares Needed Size	Mean	No %	Yes %	Hectares Needed Size	Mean
0-259	11.4	8.8	129(2); 146(1); 259(2)	184.5	15.0	5.0	259(1)	259.0
260-518	9.6	12.3	129(5); 259(2); 437(1); 518(1)	235.5	8.3	3.3	437(1)	437.1
519-777	5.3	14.0	65(1); 129(4); 194(2); 259(4); 324(1); 518(1)	219.1	10.0	11.7	65(1); 129(3); 194(1); 202(1); 259(1)	158.4
778-1036	2.6	12.3	129(4); 259(6); 518(2)	259.0	5.0	10.0	65(1); 129(2); 259(1); 518(1)	220.2
>1036	9.6	14.0	129(1); 259(3); 518(2); 809(1); 1214(1)	566.6	16.7	15.0	129(2); 259(1); 809(1)	327.8
Sub-Total	38.5	61.4	65(1); 129(16); 146(1); 194(2); 259(17); 324(1); 437(1); 518(6); 809(1); 1214(1)	275.6	55.0	45.0	65(2); 129(7); 194(1); 202(1); 259(4); 437(1); 518(1); 809(1)	235.1
Total	N = 114 (100.0%)				N = 60 (100.0%)			

N = 119
Missing Observations = 18 (Includes 3 who were not required to answer.)

Total Cases = 137
Note: Figures in parentheses indicate the number of farmers who have given a particular response. For example, farmers with a farm size between 0 - 259 hectares, 8.8 percent expressed a desire to own additional land of which two farmers wanted 129 hectares, one wanted 146 hectares, and two wanted 259 hectares for a mean of 184.5 hectares.
: 1 hectare = 2.471 acres

size and their desire for additional land resulted in a non-statistically significant relationship. However, it seems that farmers with large farms were those who needed large tracts of land. The most frequently desired parcel sizes to own and to rent/lease were 259 hectares and 129 hectares, respectively.

The relationships between the farmers' willingness to expand and whether they were looking for additional land to own, and to rent/lease (TABLE 24) were significant at the .001 level. Of the farmers who were looking for additional land to own, ninety-seven percent were also willing to expand their operation as compared to thirty-three percent who were not searching for land to own but were willing to expand the farm. Furthermore, of the farmers who were searching for additional land to rent/lease, most (92.3%) were willing to expand as opposed to forty-two percent of the farmers who were not looking for land to rent but were willing to expand their farm. In conclusion, many farmers wished to expand by enlarging their farm operation which implies there is a strong demand for land in the Hilda-Schuler district.

Future Availability of Land

It appears, based on TABLE 25, that 65.3 percent of the farmers did not plan to sell any portion of their farm within the next five years, and 86.5 percent would like their children to take over the farm. Seventy-five farmers indicated that they intended to continue farming for an

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TABLE 24

FARMERS' WILLINGNESS TO EXPAND BY THEIR DESIRE FOR ADDITIONAL LAND

	LOOKING FOR ADDITIONAL LAND TO OWN		
WILLINGNESS TO EXPAND	YES %	NO %	TOTAL %
YES	97.1	32.6	72.3
NO	2.9	67.4	27.7
TOTAL	N = 69 (100.0%)	N = 43 (100.0%)	N = 112 (100.0%)

Missing Observations = 22
Corrected Chi-Squared = 51.95; d.f. = 1; $p < .001$

	LOOKING FOR ADDITIONAL RENTED/LEASED LAND		
WILLINGNESS TO EXPAND	YES %	NO %	TOTAL %
YES	92.3	42.4	64.4
NO	7.7	57.6	35.6
TOTAL	N = 26 (100.0%)	N = 33 (100.0%)	N = 59 (100.0%)

Missing Observations = 75
Corrected Chi-Squared = 13.68; d.f. = 1; $p < .0002$

TABLE 25

LAND AVAILABILITY BASED ON THE FARMERS' FUTURE INTENTIONS

A. HOW MUCH LONGER DO YOU INTEND TO FARM?

18 av. years

N = 75 (100.0%)
Missing Observations = 62

B. DO YOU PLAN TO SELL ANY PORTION OR ALL OF YOUR FARM IN THE NEXT FIVE YEARS?

Yes 6.5% No 65.3% Don't Know 28.2%

N = 124 (100.0%)
Missing Observations = 10

C. WOULD YOU LIKE YOUR CHILDREN TO TAKE OVER THE FARM?

Yes 86.5% No 13.5%

N = 111 (100.0%)
Missing Observations = 23

Total Cases = 137 (Question 'A')
Total Cases = 134 (Questions 'B' and 'C')
Missing Cases = 3 (Includes 3 who do not own farmland)

average of another eighteen years. Interpretation of these results suggest that the future supply of farmland for farmers in the Hilda-Schuler district will be limited with the possible exception of those inheriting farmland. When a parcel of land becomes available, it may not be adjacent to a farmstead of a farmer wanting to or capable of enlarging his farm at that time. Assuming there is a considerable demand for a limited supply of land causing land prices to rise, a farmer might search for less expensive land at some distance from his farmstead even when higher priced adjacent land is available. Therefore, these situations could cause further farm fragmentation.

Reasons Why the Farmers Have Detached Parcels

Fifty-one of eighty-seven farmers explained why they had detached parcels of land (TABLE 26). Availability of detached parcels or the non-availability of land adjacent to the farmstead accounted for 78.4 percent of the reasons why the farmers had detached parcels. The 'other reasons' given were "wanted pasture to diversify farm," "the land adjacent is sand," and "to increase land holdings." As mentioned earlier, it appears that land availability was an important factor affecting land acquisition.

F. EXCHANGING AND PURCHASING TO ACQUIRE ADJACENT LAND

All the farmers stating they had detached parcels of land were asked if they would pay more for land adjacent to the farmstead than cheaper land farther away (TABLE 27) and

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TABLE 26

REASONS FOR HAVING A DETACHED PARCEL INSTEAD OF LAND ADJACENT TO THE FARMSTEAD

REASONS	%
Land adjacent to farmstead was not available	45.1
The detached parcel was the only land available	33.3
The land was owned by members of the family	5.9
Opportunity, price and type of land	5.9
Farm was sold with detached parcels included	3.9
Other reasons	5.9

N = 51 (100.0%)
Missing Observations = 36

Total Cases = 87

Missing Cases = 50 (They do not have detached land.)

TABLE 27

FARMERS' WILLINGNESS TO PAY MORE FOR ADJACENT LAND

WOULD YOU BE WILLING TO PAY MORE FOR LAND ADJACENT TO THE MAIN FARMSTEAD THAN CHEAPER LAND FARTHER AWAY?

YES 82.6%	REASONS	%
	Convenience	30.2
	Less travel time involved in equipment movement	20.8
	More economical to operate consolidated farm	15.1
	Depends on price and quality	9.4
	Saves wear and tear on machinery	7.5
	Less costs in moving machinery	5.7
	Save on man-hour time	1.9
	Others	9.4

N = 53 (100.0%)
Missing Observations = 4 (No reason given)

NO 17.4%	REASONS	%
	Depends on the quality of the land	40.0
	Depends on the value of the land	40.0
	The land is already close	20.0

N = 5 (100.0%)
Missing Observations = 7 (No reason given)

N = 69 (100.0%)
Missing Observations = 18

Total Cases = 87
Missing Cases = 50

if they would be willing to swap land parcels to obtain land closer to the farmstead (TABLE 28). A larger percentage (82.6%) of the farmers were willing to pay more for adjacent parcels than those (54.3%) willing to swap land parcels. Convenience was the main reason cited by those in the 'yes' category in both tables. Most of the comments were similar to the positive and negative effects of farm fragmentation discussed in the literature review (CHAPTER TWO). Among 'other' reasons given in TABLE 27 were "closer the better," "could work land better," "would not have to haul," "decrease liability risk," and "it makes a better farm unit." Reasons in the 'other' category in TABLE 28 included "no need for marginal land for pasture," "no swappers available," and "have facilities for cattle on detached parcel."

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G. DISTANCES FARMERS ARE WILLING TO TRAVEL

Analysis of TABLE 29 seems to indicate that as the detached parcel size increases, the farmers, in general, were willing to travel a longer distance. For distances of 1.6 to 8.0 kilometres, the percentage of farmers responding decreased as the parcel sizes increased. The opposite relationship occurred for distances greater than eight kilometres. Two exceptions to this included the response to 4.8 and 6.4 kilometres under the 64.8 hectare column. The 9.6 to 16.1 kilometre range received the highest percentage of responses to all four parcel sizes.

TABLE 28

FARMERS' WILLINGNESS TO SWAP LAND PARCELS

WOULD YOU BE WILLING TO SWAP LAND PARCELS TO OBTAIN LAND CLOSER TO THE MAIN FARMSTEAD?

YES 54.3%	REASONS	%
	Convenience	36.8
	Less time spent travelling	21.1
	A lesser distance to move machinery	15.8
	Only if the land is of comparable quality	10.5
	Cheaper operating costs	7.9
	Saves wear and tear on machinery	5.3
	To have consolidated farm	2.6
	N = 38 (100.0%)	

NO 45.7%	REASONS	%
	Satisfied with present farm layout	28.0
	The detached parcels are of better quality	20.0
	Increase probability of catching rain showers, avoiding hail storms, and getting a crop	16.0
	It is better to have detached parcels	8.0
	Proximity to town	4.0
	Detached parcel is near the river	4.0
	Detached land is rented	4.0
	Others	16.0
	N = 25 (100.0%)	
	Missing Observations = 7 (No reason given)	

N = 70 (100.0%)
Missing Observations = 17

Total Cases = 87

Missing Cases = 50

TABLE 29

DISTANCES FARMERS ARE WILLING TO TRAVEL FROM THE FARMSTEAD TO VARIOUS SIZES OF DETACHED PARCELS

DISTANCE (In Kilometres)	PARCEL SIZE IN HECTARES 64.8 %	129 %	194 %	259 %
1.6	9.0	4.7	2.4	2.3
3.2	16.9	7.1	2.4	2.3
4.8	11.2	11.8	6.1	1.2
6.4	11.2	16.4	9.8	9.2
8.0	21.4	17.6	15.8	5.7
9.6-16.1	22.5	27.1	35.4	41.4
17.7-32.2	6.7	14.1	23.2	24.1
33.8-64.4	1.1	1.2	3.7	10.3
66.0-96.6	0.0	0.0	1.2	2.3
over 96.6	0.0	0.0	0.0	1.2
	N = 89 (100.0%)	N = 85 (100.0%)	N = 82 (100.0%)	N = 87 (100.0%)
	M.O.=48	M.O.=52	M.O.=55	M.O.=50

Total Cases = 137

Legend: 1 hectare = 2.471 acres; 1 kilometre = .621 miles.

: Farmers indicated the distance they were willing to travel to each parcel size. For example, 9 percent of the farmers were willing to travel 1.6 kilometres to operate a parcel size of 64.8 hectares.

Since farm fragmenters were already travelling, they may have been more willing to travel than non-fragmenters. Farm fragmenters travel from the farmstead to detached, corner-touching, and road or rail separated parcels, and/or from a non-farm residence to the farmstead. In this study, the fragmenters and non-fragmenters did not significantly differ in their response but this may have been due to approximately ninety-three percent of the farmers being fragmenters. Furthermore, there were no significant differences in the responses by the farm residents as opposed to non-farm residents, and by farmers with detached parcels as compared to those without detached farm land.

H. CONCLUSION

Discussion of Results

Results of this study generally support the conclusions of other similar studies. There were, however, several contradictory findings.

Attitude statements one through five, seven, eight, twelve, thirteen, nineteen, and twenty-two (see TABLE 9) reflected similar agricultural issues as in the study by Boylen (1976). In most cases the results were much the same. Contrary to Boylen's findings, it was found that the Hilda-Schuler farmers displayed a capitalistic philosophy in statement one, considered land ownership as a means of having land to farm, and were of the opinion that the supply of land for farming is limited. In addition, Boylen's

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results to questions on the farmers' willingness to expand (61.0%) and the main kind of tenure agreements preferred (crop-share, 50.0%) are similar. Contradictory to this author's study, were Boylen's conclusions on lengths of agreements preferred where more of her respondents (38.0%) preferred the short-term agreement.

Risk, uncertainty and security all play an important role in a farmer's decision-making process, according to Ibery (1978). As expected, the Hilda-Schuler farmers reflected concern over risk and uncertainty in the attitude statements (TABLE 12). In addition, 'certainty' and 'security' were reasons specified for preferring intermediate and long term tenure agreements.

This study essentially confirms the results found by Sahir (1977) on reasons why seasonal residents and non-resident farmers live off the farm. Examples of similar reasons stated were: the school needs of the children, the lack of services on the farm, old age, and semi-retired. Furthermore, Sahir found that resident farmers had relatively higher income levels and were in a lower age group as compared to non-farm residents, and these findings were similar to the author's study.

When Butterwick and Rolfe (1965) questioned the Yetminster (Dorset, England) farmers about their plans on buying and selling land, they inferred that the younger generation (under fifty years) were more active in the land market than the older generation. These conclusions were

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partially confirmed by this author's study. Farmers under the age of fifty-five years were twice as willing to expand their operation (85.3%) and twice as many were searching for additional land to own (71.1%) as compared to those over fifty-five years (42.9%, 35.5%). A non-significant relationship occurred between age and the sale of land by a farmer. A reason for this may have been the emotional attachment to owned land, especially when it has a long family tradition.

Summary

This chapter investigated hypothesis one which hypothesized that direct relationships existed between the farmers' socio-personal characteristics and his opinion on various agricultural issues, and whether the attitude responses were related to the farmers' residential pattern and whether or not the farmers operated detached parcels. Analysis indicated that no statistically significant correlations existed, however, it is possible other variables affected their opinions. An attitude is also influenced by inculcation by peers, parents or reference groups and prevailing social attitudes. Therefore, it is possible the replies to the attitude statements could have represented a typical or 'norm' response by a well integrated agricultural community.

The farmers were alike in many ways. A majority of the farmers were German (74.5%), married or separated (92.7%); were raised on a farm (96.3%) and had farmed in the

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Hilda-Schuler area (86.1%). Approximately sixty-nine percent farmed with their father for an average of twelve years, and eighty-two percent farmed on their own for an average of about twenty years. Most of the farmers (78.1%) had between seven to thirteen years of formal schooling. The family and the lawyer were the two main sources of information which farm tenants utilized when drafting a rental or lease agreement. Approximately 74.0 percent were resident farmers. At least eighty-one percent of the farmers operated fragmented farmland. About ninety-three percent had a non-farm residence and/or had fragmented farmland. Data on gross family income, organization membership of families, and the farmers' age were more evenly distributed.

Opinions of all the farmers indicated: agreement with statements concerning land ownership rights (1,4), financial benefits of renting (5,9), risk and uncertainty in renting (11, 17, 22), controlled urban expansion and foreign ownership (14, 16), success without formal education (10), reduced operating costs for resident farmers (15), and government financial assistance (20); and disagreement with statements about the unlimited supply of farmland in Alberta (3), city life being better than farm life (6), renting only when lacking the finances to buy (12), the time wasted keeping farm records (18), and Hutterites purchasing land (21). Attitudes related to inadequate leasing markets (7), land as a community resource (2), owning land means less money spent in the long run (13), and farming efficiency (8,

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19) were scored as undecided. There were no significant differences between the farm fragmenters and non-fragmenters opinions.

A summary of the results of the behavioural questions are as follows. Crop-share agreements (64.1%) and long-term agreements (47.9%) were preferred by most of the tenants. The most common reason (54.4%) given for renting or leasing was that the land was not for sale. Some of the main reasons for having a non-farm residence were the school needs of the children, semi-retirement, and closeness to off-farm employment. It appears that many of the farmers shopped for consumer goods in Medicine Hat. Most of the farmers wanted to expand or enlarge their operation. Two-thirds of the farmers did not plan on selling any portion of their farm in the next five years. Eighty-six percent would like their children to take over the farm. Accounting for seventy-eight percent of the reasons for having a detached parcel was land availability. A large percentage (82.6%) of the farmers were willing to pay more for adjacent land than those (54.3%) willing to swap parcels and both groups cited convenience as their main reason. There seemed to be a trend towards farmers willing to travel longer distances for larger land parcels. No statistically significant relationships existed between the farmers' residence pattern and a) their willingness to swap parcels or to pay more for adjacent land, b) their desire to expand their operation or sell some of their land, and c) the distances they were willing to

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travel for detached parcels.

Only six associations were significant at the .05 level of significance. They were the farmer's age and his willingness to expand, and if he was searching for land to own; the farmer's willingness to expand if he was searching for land a) to own, and b) to rent or lease; and the farmer's residence pattern, and their age and the gross family income level.

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VI. CHAPTER SIX

FARM FRAGMENTATION IN THE HILDA-SCHULER DISTRICT

A. INTRODUCTION

A consolidated farm denotes the situation in which a farm consists of a single tract of land surrounding a farmstead. Data on one hundred and thirty-seven farms in the Hilda-Schuler district indicates that only ten farms were consolidated. The remaining one hundred and twenty-seven farms had either fragmented farmland or operational headquarters. The purpose of this chapter is to investigate the spatial characteristics of the farms such as the number of parcels per farm and the distance to the parcels; the advantages and disadvantages of operating a spatially dispersed farm in the study area; and the different ways farmers, private companies and government agencies can possibly alleviate the disadvantages associated with a fragmented farm. In addition, the following hypotheses are tested: the number of parcels operated will increase with farm size; and as distance increases from the farmstead the mean parcel size will increase, the type of production at the detached parcels will change from arable to pasture, and the percentage of land ownership and the frequency of fertilizer input will decrease.

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B. SPATIAL CHARACTERISTICS OF THE AGRICULTURAL HOLDINGS

Three types of farm fragmentation were evident in the Hilda-Schuler district. They were land fragmentation, operators residing permanently or seasonally off the farm, and the fragmentation of the fixed and mobile investments of an operational centre. Only twenty-six out of one hundred and thirty-seven farmers had land consolidated farms. The other farms were farmsteads with parcels corner-touching or separated by roads or rail lines, and/or detached parcels. Twenty-nine farmers resided off the farm and another seven farmers were seasonal residents residing on the farm for less than seven months of the year. Several operators had storage facilities for machinery and/or farm products on parcels other than the farmstead. In some instances livestock were grazed on land operated by a grazing association sometimes referred to as a community pasture. Following is a discussion on each of the above forms of farm fragmentation.

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Number and Size of Parcels

In TABLE 30 the total number of parcels in each farm operation are shown according to the tenure of the operators and by the operators' place of residence. Most farms (87.6%) consisted of four or less parcels. Although the mean number of parcels per farm was three, the farms ranged from land consolidated to a farm comprised of ten parcels. One parcel farms had a mean size of two hundred and seventy-five hectares which was almost one quarter the mean size (1014.5

TABLE 30

TENURE OF OPERATOR AND PLACE OF RESIDENCE BY THE NUMBER OF PARCELS PER AGRICULTURAL HOLDING

		NUMBER OF LAND PARCELS IN EACH FARM										
		CONSOLIDATED NO.	2 NO.	3 NO.	4 NO.	5 NO.	6 NO.	7 NO.	8 NO.	9 NO.	10 NO.	TOTAL
TENURE	TENANT	1	2									3
	OWNER	19	12	7	5	1						44
	PART OWNER/ PART TENANT	6	25	23	20	8	5		2		1	90
	TOTAL FARMS	26	39	30	25	9	5	0	2	0	1	137
RESIDENCE	RESIDENT FARMER	10	28	27	21	8	4		2		1	101
	SEASONAL RESIDENT	1	2	1	2		1					7
	NON-FARM RESIDENT	15	9	2	2	1						29
TOTAL FARMS		26	39	30	25	9	5	0	2	0	1	137
TOTAL PARCELS		26	78	90	100	45	30	0	16	0	10	395
MEAN FARM SIZE (In Hectares)		275.3	859.0	703.6	1605.6	2703.3	1004.1	0	2512.3	0	2719.5	1014.5

hectares) of all the farms, whereas the mean size (1187.6 hectares) for the fragmented farms was larger than the overall mean. Although it appeared that farms with more parcels had a larger mean farm size, there was no statistical correlation between the number of parcels and an increase in farm size.

Over ninety-three percent of the owner/tenants had fragmented land as compared to tenants with sixty-six percent and owners with fifty-seven percent. Of all the consolidated parcels seventy-three percent belonged to owners. Owner/tenants had farms ranging between sixty-five to over 4,000 hectares with most (58.8%) of the farms ranging between three hundred and ninety to approximately 1,040 hectares. Approximately eighty-six percent of the owners and all tenants had farms with less than five hundred and nineteen hectares.

Approximately ninety percent of the resident farmers, eighty-six percent of the seasonal farm residents, and forty-eight percent of the non-farm residents had fragmented farmland. Sixteen of the twenty-six land consolidated farms were operated by seasonal and non-farm residents. Three farms had more than six parcels per farm totalling about 7,744 hectares and were operated by resident, owner/tenants.

There were three hundred and ninety-five parcels ranging in size from less than sixty-five hectares to over 4,144 hectares which were grouped into five categories: twenty-six consolidated, one hundred and eleven farmstead,

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fifty road and three rail separated, and one hundred and seventy-seven detached (TABLE 31). Of the total farm area (138,985.4 hectares), ninety-five percent was fragmented. More than twice as many parcels were detached from the farmstead than were contiguous. Less than one percent difference existed between the number of parcels, under one hundred and thirty-one hectares in size, in the consolidated (50.0%) and fragmented (49.3%) categories. This relationship was also within two percent (76.9%; 75.3% respectively) for parcels under two hundred and sixty hectares in size. However, all twelve parcels over 1,296 hectares belonged to fragmented farms. Furthermore, the mean parcel size of the farmsteads of the fragmented farms was almost twice the mean size of consolidated parcels.

Distance to the Parcels

Farmers operating fragmented farms spend time transporting themselves and the necessary farm equipment between the farmstead and detached parcels. Since increased travel time and transportation costs are realized as the distance increases from the farmstead, it was hypothesized that as the distance increased a) the parcel size would increase, b) the percentage of land ownership decreased, and c) the percentage of arable land decreased. In TABLE 32 the land ownership, the land use and the mean parcel size are shown according to distances from the farmstead.[22]

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[22]The method of calculating distances was discussed in CHAPTER FOUR.

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TABLE 31

LAND FRAGMENTATION BY PARCEL SIZE (IN HECTARES)

PARCEL SIZE (In Hectares)	CONSOLIDATED No.	LAND FRAGMENTATION FARMSTEAD No.	CORNER No.	ROAD OR RAIL No.	DETACHED No.	TOTAL
0 - 65	8	6	14	14	43	85
66 - 130	5	25	8	14	58	110
131 - 259	7	34	2	14	46	103
260 - 389	2	15	4	8	11	40
390 - 518	1	10			5	16
519 - 648		6		1	2	9
649 - 777		3			1	4
778 - 907	1	3			1	5
908 - 1036	1			1	1	3
1037 - 1295	1	4			3	8
1296 - 1554					1	1
1555 - 1813						
1814 - 2072					1	1
2073 - 4144		3		1	3	7
> 4144		2			1	3
TOTAL PARCELS	26	111	28	53	177	395
MEAN PARCEL SIZE	275.3	525.1	127.7	242.1	322.8	351.9
TOTAL FARMS	26	111	25	46	87	137
TOTAL AREA	7,159.0	58,284.4	3,575.5	12,828.9	57,137.6	138,985.4

Note: Out of 137 farms, 26 were land consolidated farms and 111 fragmented farms had farmsteads along with corner-touching, detached and/or road or rail separated parcels.

TABLE 32

DISTANCE BY NUMBER OF PARCELS, LAND USE AND LAND OWNERSHIP

	PARCELS NO.	MEAN PARCEL SIZE ha.	PARCELS OUTSIDE STUDY AREA ha.	No.	LAND USE ARABLE %	PASTURE %	LAND OWNERSHIP OWN %	RENT/LEASE %
CONSOLIDATED	26	275.3	0.0	0	51.0	49.0	65.5	34.5
CONTIGUOUS:								
FARMSTEAD	111	525.1	4774.6	7	37.3	62.7	52.7	47.3
CORNER-TOUCHING	28	127.7	0.0	0	47.4	52.6	54.8	45.2
ROAD AND RAIL	53	242.1	323.8	2	43.1	56.9	52.9	47.1
DETACHED:								
Kilometers								
0.0 - 1.6	54	169.2	388.5	1	57.8	43.2	59.1	40.9
1.7 - 3.2	32	147.7	129.5	1	78.2	39.8	61.6	38.4
3.3 - 4.8	24	158.2	203.0	1	64.5	35.5	59.1	40.9
4.9 - 6.4	11	223.7	0.0	0	73.8	27.2	56.3	44.7
6.5 - 8.0	5	121.8	157.8	1	54.5	45.5	54.5	45.5
8.1 -16.0	35	329.8	3,492.5	3	29.9	70.1	41.1	58.9
16.1-24.0	9	800.2	3,043.3	3	4.9	95.1	31.5	68.5
24.1-32.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0
32.1-48.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0
48.1-64.0	6	2,933.4	259.0	2	2.6	97.4	13.6	86.4
64.0	1	64.8	0.0	0	0.0	100.0	0.0	100.0
TOTAL	395	351.9	12,773.0	21	35.6% (138,985.4 ha.)	64.4%	47.3% (138,985.4 ha.)	52.7%

Seventy-one percent of the detached parcels were within eight kilometres of the farmstead and ninety-one percent were within sixteen kilometres. The mean distance to the detached parcels was about nine kilometres while the maximum distance to one parcel was three hundred and sixty kilometres. There were no steady increases in the mean sizes of the detached parcels as the distance increased from zero to greater than sixty-four kilometres. However, the parcels at a distance greater than 1.6 kilometres, with the exception of nine parcels, had a tendency to increase in mean size. This was significant because a similar response occurred when the farmers were asked how far they would be willing to travel from the farmstead to various sizes of detached parcels (TABLE 29 in CHAPTER FIVE).

As distance increased from the farmstead there appeared to be a change in the amount of land owned and under cultivation. Land ownership was highest (65.5%) amongst the land consolidated farms. Corner-touching, and road and rail separated parcels ranged from about fifty-two to fifty-five percent land ownership. In contrast, the detached parcels ranged between sixty-two to zero percent land ownership, decreasing in general, as the distance from the farmstead increased. Fifty-one percent of the area of consolidated parcels was arable as compared to the corner-touching and road or rail separated parcels which had between thirty-seven to forty-seven percent arable. Although detached parcels within eight kilometres of the farmstead

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had a higher percentage of arable land than the non-detached parcels, the percentage of arable land declined as distances increased from approximately five kilometres to over sixty-four kilometres.

A total of 12,773 hectares or twenty-one out of three hundred and ninety-five parcels were located outside the study area. Some of these parcels were located east across the provincial border into Saskatchewan. Seven farmers had their farmstead outside the study area but were operating land within the Hilda-Schuler district.

Residential Pattern

There were seven seasonal residents, twenty-nine non-farm residents and one hundred and one resident farmers. The location of the homes of the seasonal and non-farm residents is provided in TABLE 33. All of the seasonal residents and most of the non-farm residents had residences in Medicine Hat. The hamlets of Hilda and Schuler and the city of Medicine Hat were all within approximately one hours drive from the farms permitting daily travel to conduct agricultural operations. However, six of the non-farm residents resided, in either Calgary, Edmonton or Kelowna, over three hundred kilometres from their farms. As expected, these farmers had grain farms requiring most fieldwork during planting or harvesting as compared to livestock operations which tend to demand an evenly distributed labour input throughout the year. Eighty-three percent of the non-farm residents had grain farms as compared to seasonal

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TABLE 33

LOCATION OF RESIDENCE OF SEASONAL AND NON-FARM RESIDENTS

PLACE	1976 POPULATION NO.	SEASONAL RESIDENTS	NON-FARM RESIDENTS
Hilda	80		1
Schuler	121		4
Medicine Hat	33,220	7	18
Kelowna, B.C.	51,995		1
Edmonton	461,559		2
Calgary	470,043		3
Total Cases = 36		N = 7	N = 29

TABLE 34

TENURE OF THE OPERATOR BY RESIDENTIAL PATTERN

	RESIDENT %	SEASONAL RESIDENT %	NON-FARM RESIDENT %	TOTAL %
TENANT	2.0		3.4	2.2
OWNER	22.0	43.0	65.6	32.1
PART OWNER/ PART TENANT	76.0	57.0	31.0	65.7
TOTAL	N=101 (100.0%)	N=7 (100.0%)	N=29 (100.0%)	N=137 (100.0%)

residents with fifty-seven percent and residents with fourteen percent. A majority (78.2%) of the resident farmers had both livestock and crops. Nine farmers had only livestock, eight were resident farmers and one was a non-farm resident living in Medicine Hat.

Most of the resident and seasonal residents were owner/tenants (TABLE 34). Although the non-farm residents had a mean amount rented three times as large as the mean amount owned (TABLE 35), only thirty-four percent were either tenants or owner/tenants. Resident farmers on the average rented more land than they owned. Seasonal (443 hectares) and non-farm residents (498 hectares) had a mean farm size considerably less than the overall mean farm size (1014.5 hectares). In contrast, the resident farmers had a mean farm size (1202.4 hectares) larger than the overall mean.

Off-farm residency is often associated with off-farm employment by the operator and/or spouse preferring to reside in proximity to their place of employment. Off-farm employment on the one hand, is sometimes considered to be an indicator of subsistence farming due to the farm size being incapable of supplying the operator with the desired standard of living. On the other hand, it can be a desired way of life, with an income from a profitable sideline business, which is sometimes used to improve the farm. A majority (68.2%) of the farmers with off-farm employment had a residence off the farm. Furthermore, off-farm income for

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TABLE 35

RESIDENTIAL PATTERN BY THE AVERAGE AMOUNT OF LAND OWNED, RENTED AND MANAGED

	MEAN SIZE (IN HECTARES)			
RESIDENTIAL PATTERN	OWNED ha.	RENTED ha.	MANAGED ha.	TOTAL ha.
RESIDENT FARMER	577.0 (99)	808.1 (79)	160.5 (3)	1202.4 (101)
SEASONAL RESIDENT	341.2 (7)	178.1 (4)	0.0 (0)	442.9 (7)
NON-FARM RESIDENT	223.7 (28)	783.5 (10)	172.6 (2)	498.0 (29)
TOTAL	490.9 (134)	778.3 (93)	165.4 (5)	1014.5 (137)

Total Cases = 137

Bracketed figures indicate the number of respondents.

eleven out of fourteen non-farm residents consisted of more than sixty-nine percent of their total income (TABLE 36), whereas, most resident farmers received less than thirty percent of their income off the farm. Three of the four non-farm residents had spouses who were employed off the farm. Medicine Hat was the most common centre of employment. Considering the average farm size was 1,014 hectares, ninety-one percent of the farmers with off-farm income had well below average farm sizes and those above the mean farm size received a maximum of fifteen percent from off-farm income.

Fragmenting the Operational Centre

Farmers were inclined to locate portions of their operational centre on parcels other than the farmstead, and/or in a nucleated settlement. Although incorporated urban municipalities in Alberta have residential zoning bylaws prohibiting the raising of livestock, and limiting the height and area of accessory buildings, unincorporated settlements may allow storage facilities for farm products and implements. A field check revealed farm machinery was stored within the unincorporated hamlets of Hilda and Schuler. Numerous storage facilities such as granaries and corrals were seen on parcels other than the farmsteads (see PLATES 9, 10, 11, and 12). It appeared that dispersed storage facilities for farm products and implements was a common practice among the Hilda-Schuler farmers.

Approximately 37,000 hectares (14.2%) of the entire

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TABLE 36

OFF-FARM EMPLOYMENT BY RESIDENTIAL PATTERN AND FARM SIZE

RESIDENTIAL PATTERN	INCOME SOURCE			PLACE OF EMPLOYMENT		FARM SIZE
	FARM	OFF-FARM				
		Operator	Wife	Operator	Wife	
	%	%	%			ha.
Non-Farm Resident						
1	0.0	100.0		Schuler		280
2	0.0	100.0		Calgary		259*
3	0.0	100.0		Medicine Hat		130*
4	0.0	100.0		Edmonton		130*
5	0.0	75.0	25.0	unknown	unknown	162
6	10.0	90.0		Medicine Hat		65*
7	20.0	80.0		Medicine Hat		65*
8	20.0	80.0		Medicine Hat		65*
9	20.0	80.0		Kelowna, B.C.		130*
10	25.0	75.0		Medicine Hat		389
11	30.0	70.0		Edmonton		194
12	50.0	25.0	25.0	Schuler	Schuler	389
13	80.0	20.0		Medicine Hat		389
14	85.0	10.0	5.0	Medicine Hat	unknown	1,093
Seasonal						
1	65.0	35.0		Medicine Hat		324
Resident						
1	50.0	30.0	20.0	unknown	unknown	338
2	60.0	40.0		Hilda		581
3	75.0	25.0		Medicine Hat		186
4	80.0	20.0		Medicine Hat		648
5	85.0	15.0		Schuler		842
6	90.0	10.0		Medicine Hat		259*
7	90.0	10.0		Schuler		2,946

N = 22

Missing Observations = 115 (No answer = 19; Other source = 3; and 100 percent from farm income = 93 operators)

Legend: *Consolidated land

: Farmers stating they received 100 percent of their gross family income off the farm may have invested the farm income back into the farm or at the time of the survey the farm lost income or made no net income.

PLATE 9. Corral Structure Near Highway 41

PLATE 10. Isolated Granaries on Section 16, Township 13, Range 5

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PLATE 11. Quanset and Fuel Tanks on Section 3, Township 13, Range 5

PLATE 12. An Abandoned Farm Used for Storage Purposes on Section 24, Township 17, Range 1

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study area were being utilized by three grazing associations. Koomati, part of the Suffield Military Reserve, was rented to the Drowning Ford Grazing Association in collaboration with the Department of Regional Economic Expansion (D.R.E.E.). Sixty-nine farmers were members of either the Drowning Ford Gazing Association, the B. T. Grazing Association, or the Many Island Grazing Association. Although farmers belonging to these associations were able to increase herd size without purchasing additional land, their livestock were separated from the farm.

C. EFFECTS OF FARM FRAGMENTATION

Benefits and problems are associated with operating a fragmented farm. Disadvantages of fragmentation can reduce the productivity of the land, increase the operating costs, result in wasted time and energy transporting farm products and machinery, and create social conflict. The benefits include soil diversification, spreading of environmental risks, goods and services offered by an agglomerated centre, and enabling the farmer to expand his operation to meet rising agricultural costs. Some of these negative and positive effects were experienced by the Hilda-Schuler farmers.

Land Use and Distance

It was shown in TABLE 32 that there appeared to be a change in the type of land use, arable to pasture, as the distance increased from the farmstead. The farmers were

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asked to explain why the detached parcels had a different land use than the farmstead. The most common reason, given by ten farmers, was that they wanted to diversify the farm operation. Eight farmers indicated that the land use difference was due to the physical environment. Reasons for farms having detached parcels in pasture included "the parcel is lower land with alkali," "not suitable for crop because of the river hills," "the parcel is non-arable land," "the detached parcel has sandy soil," and "in pasture because the land was stony and hilly." Two farmers with detached parcels in crop provided the following reasons "lack of water prevents use for cattle," and "the heavier soil is more suited to grain." Another three farmers stated that the detached parcels were in pasture because the land could not be cultivated due to provincial land use regulations on grazing leases.[23] Only twenty-one of eighty-seven farmers with detached parcels provided reasons for the difference in land use. Some had no land use difference, that is, having crops and pasture on both the farmstead and the other parcels but possibly in different proportions.

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[23]"Leased lands must be grazed at the specified carrying capacity with livestock owned by the lessee. A special cultivation permit may be issued for feed growing on a specified area of the lease. A lessee is given first opportunity to renew his lease if the land is not required for higher priorty uses." (Alberta, Energy and Natural Resources. 1979. Administration of Alberta Public lands. Page 7.)

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Fertilizer Inputs and Distance

Chisholm (1972) suggested that the application of fertilizers decreases with distance from the farmstead which may lead to soil depletion of distant parcels. When questioned about fertilizing detached parcels (TABLE 37), a majority (58.6%) did not use fertilizer. However, one farmer stated that fertilizer was not applied because the study area receives insufficient moisture to utilize fertilizer effectively. Moreover, according to Lupton (1969, page 30) "on the light brown soils of southeastern Alberta, there is little value, however, in intensifying an operation by adding large amounts of fertilizer or labour to a soil which in many years lacks sufficient moisture to allow crops to utilize the inherent fertility already present." Therefore, attempts at determining if the farmers exhibited a distance-decay effect when using fertilizers were thwarted.

Increased Costs and Wasted Time and Energy

Time and energy is wasted in transporting farm operators, farm products and implements to dispersed fields from the farmstead and from one detached parcel to another. Transporting farm inputs and outputs increases farm production costs especially with current inflationary rates on fuel, lubrication and repair costs. Various types of farm implements were moved by the farmers to their detached parcels (TABLE 38). The most common implements moved were tractors, grain trucks, swathers, cultivators, combines and half-ton trucks. A rock picker, fuel trailer and rod weeder

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TABLE 37

FREQUENCY OF FERTILIZER APPLICATION

FREQUENCY WITH WHICH FARMERS FERTILIZE DETACHED PARCELS	%
Never Fertilize	58.6
Seldom Fertilize	3.4
Once every two years	2.3
Only when needed	1.2
Fertilize only the hay fields	1.2
No Answer	33.3

N = 87 (100.0%)

TABLE 38

FARM IMPLEMENTS MOVED TO DETACHED PARCELS

FARM IMPLEMENT	NO. OF FARMERS	FARM IMPLEMENT	NO. OF FARMERS
Tractor	67	Grain Auger	52
Grain Truck	66	Baler	50
Swather	65	Harrows	44
Combine	64	Hay Rack	34
Cultivator	64	Rake	13
Half-Ton Truck	64	Cattle Trailer	13
Discer	55	Others	3
Seeder	53		

N = 87
Note: Farmers could provide multiple responses.

were the 'other' types of machinery.

Driving on paved or gravel roads instead of the field can cause increased wear and tear on farm machinery. Over seventy percent of the farmers (TABLE 39) indicated that there was increased wear and tear on equipment. In the 'others' category the following comments were provided. "In the field the tire lugs sink into the soil while on the road all the weight is put on the lugs which tends to break the cord in the tire body on either side of the lugs." "If the tires run on an angle, the road can chew the rubber off." Steel wheels on seeders and packer wheels on drills can be damaged by roads.

Theft and Vandalism

Farmers with detached parcels were asked if there had been any vandalism or theft to property. Out of eighty-seven farmers with detached parcels, forty-four stated there had been no theft or vandalism to property as compared with twenty-nine who had experienced theft or vandalism to property.

Scheduling Difficulties

Farmers with detached parcels were asked if they encountered any scheduling difficulties. Forty-nine farmers were not confronted with scheduling difficulties as compared with nineteen farmers who had difficulties. Access to some detached parcels may have been a problem because travel on road allowances was inadvisable as a result of poor weather conditions.

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TABLE 39

WEAR AND TEAR ON FARM MACHINERY

WOULD YOU SAY THERE IS MORE WEAR AND TEAR ON YOUR MACHINERY WHEN YOU DRIVE ON PAVED OR GRAVEL ROADS INSTEAD OF THE FIELD?

YES 72.2%

REASONS	%
Greater wear on tires from paved and gravel roads	44.9
Machinery is not built for the faster travel on the roads	18.3
Vibration caused by the roads damages the equipment	10.2
Field driving is smoother and the ground is softer	8.2
Gravel is hard on windshields	6.1
Faster travel can twist large implements	4.1
Others	8.2

N = 49 (100.0%)
Missing Observations = 3 (No reason given)

NO 27.8%

REASONS	%
Not over the short distance	33.3
Very little difference	16.7
Just travel slower	16.7
Parcels are close by	16.7
There is no wear and tear on shears and blades when put into transport	16.7

N = 6 (100.0%)
Missing Observations = 14 (No reason given)

N = 72 (100.0%)
Missing Observations = 15

Total Cases = 87

Missing Cases = 50

Traffic Hazard

Slow moving, large farm implements on public roads presents a serious traffic hazard especially when the machinery extends into the oncoming lane or during periods of partial darkness between day and night. Although new implements have been designed for travel on primary roads, they still hinder traffic flow on secondary roads. Illustrated in PLATES 13 and 14 are examples of farm implements being moved in the Hilda-Schuler district.

Benefits of Farm Fragmentation

Farm fragmentation in certain circumstances are advantageous to a farm operation. When a farmer wants to enlarge his farm, the land adjacent to the farmstead may not be available for rent or sale. Furthermore, a distant parcel might have a lower market price than adjacent land. Thus the acquisition of detached parcels enables the farmer to increase his agricultural holdings to meet rising costs or to raise his standard of living. Farms in southeastern Alberta had one of the largest rates of increase in farm size as compared to other parts of the province (Lupton, 1969). Therefore, the demand for land may have increased land prices and lowered land availability forcing the farmer to acquire land wherever possible at the expense of fragmenting his farmland. It was previously mentioned in TABLE 26 that land availability was the main reason for having detached parcels. Other advantages associated with fragmented farm land were referred to by farmers explaining

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PLATE 13. Tractor and Baler on Gravel Road

PLATE 14. Tractor and Cultivator on Gravel Road

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why they would not exchange or pay more for land adjacent to the farmstead (discussed in CHAPTER FIVE).

With the agglomeration of service functions into urban centres, farmers have moved from the farmstead to take advantage of economic, educational and social amenities. Furthermore, during the off-season farmers can seek and reside near off-farm employment. If more trips are made by the operator and his family to an urban centre for goods and services (for example grocery shopping, taking children to school or to athletic functions, purchasing agricultural products, and for off-farm employment) than to the fields, residing in an urban centre would reduce transportation costs and travel time. Only twenty-six percent of the farmers resided off the farm. The resident farmers may have considered an hour's drive or less to Medicine Hat worth the time and expense in order to reside and raise their children in a country setting. Commuting from the farmstead to a city may be equated with a non-farmer travelling from the suburbs to a downtown office in large cities.

It appeared that the Hilda-Schuler farmers stored farm products and implements on detached parcels which sometimes reduces travel time and production costs. Instead of transporting products to the farmstead they can be stored at the actual site of the labour. Furthermore, storage facilities on scattered parcels as opposed to the farmstead may be closer to the market. This would be mainly beneficial when numerous trips are needed to transport the products. By

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travelling in a half-ton truck to farm equipment left on the detached parcel, less wear and tear occurs on the farm equipment and travel time is reduced.

There appears to be many disadvantages and advantages to operating a fragmented farm. However, each positive and negative effect has a different value to each farmer and the choice between consolidation and fragmentation may be limited. Farmers can alleviate some of the disadvantages.

D. ALLEVIATING THE DISADVANTAGES OF FARM FRAGMENTATION

The eradication of farm fragmentation is almost impossible especially in a democratic society. Attempts at controlling the causes of farm fragmentation and forcing farmers to consolidate farms is very difficult to accomplish without impinging upon the democratic rights of individuals. Farm fragmentation in some cases is unavoidable or necessary. Moreover, since beneficial aspects are associated with farm fragmentation, possibly the disadvantages could be alleviated instead of trying to eliminate farm fragmentation. Farmers, private companies and various levels of government are all capable of diminishing the disadvantages of farm fragmentation in the Hilda-Schuler district.

At the Farm Level

Exchanging parcels with other farmers to obtain land closer to the farmstead parcel is one of the best methods of reducing the disadvantages of a fragmented farm. This

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requires the cooperation between two or more farmers which poses problems of equitable exchange depending on what each farmer considers is the value and quality of the land. For those farmers wanting to retain scattered parcels for beneficial reasons, there are several ways of reducing the associated disadvantages. Prior to moving large farm implements to a distant field, information on soil conditions of the parcel can be obtained by telephoning a farmer near the parcel or by driving to the parcel in a half-ton truck. When moving farm machinery the shortest path to the parcels should be taken. The risk of becoming a traffic hazard is decreased by avoiding machinery moves during heavy traffic hours, night time, dawn and dusk. Travel time and wear and tear on implements is diminished by transporting slow moving implements on flat-bed trailers when long distances are involved. Having a residence centrally located to the dispersed parcels may be advantageous if the central location is within an urban centre, thereby reducing travel time and costs to economical, educational and social amenities offered by the centre.

Farm machinery and storage facilities left on the distant parcels are susceptible to theft and vandalism unless they are properly secured. Livestock should be branded because registered brand owners in Alberta are protected through the Livestock Brand Inspection Act. Further protection is obtainable by purchasing farm

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insurance, periodical inspection of the fields and livestock, and the vigilance of neighbouring farmers.

Farmers today operate in an untenable position due to a cost-price squeeze. The farmer is trapped between the relatively low prices offered by the world market for his products and the high expenditures for his agricultural inputs, such as machinery, fertilizer and land (Sublett, 1975). One Hilda-Schuler farmer commented that:

> "Prices for farm grains, especially wheat, are far below what they should be. A farmer is the only labourer whose produce had remained at virtually the same market price for more years than I can remember. In fact, during the last three years its dropped seventy-five cents per bushel. At the same time a farmer's costs have sky rocketed in every area with increases being over one hundred percent on some items in a year."

To avoid the cost-price squeeze and for the farmer to maintain his desired standard of living, he may intensify his operation, enlarge his land area, and/or seek off-farm income. The latter two alternatives can lead to farm fragmentation. The Hilda-Schuler farmers were questioned on whether the price for farm products were too low or machinery costs were to high, and what their recommendations were for easing the present shortage and/or high cost of agricultural land. According to TABLE 40, it appears that most of the farmers considered farm product prices were too low and machinery costs were too high. Responses in the 'other' category included "machinery quality is getting lower," and "agricultural product prices must remain low in order to compete with world export prices."

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TABLE 40

FARM PRODUCT PRICES AND MACHINERY COSTS

IS THE PRICE FOR FARM PRODUCTS TOO LOW OR ARE MACHINERY COSTS TOO HIGH?

RESPONSE	%
The price for farm products are too low and machinery costs are too high	50.4
Machinery costs are too high	24.0
Farm product prices are too low	14.4
Machinery repairs and fuel costs are too high	5.6
Cattle prices are satisfactory	3.2
Other	2.4

N = 125 (100.0%)
Missing Observations = 12

Total Cases = 137

A reduction in land ownership by non-farmers was the most common recommendation for easing the present shortage and/or high cost of agricultural land (TABLE 41). A recommendation on limiting farm size may be from some farmers being envious of the few farmers in the Hilda-Schuler district who operate very large farms. Among 'other' responses given were suggestions such as "reduce the capital gains tax on farmland," "decrease the demand for land," "to be classified as a farmer, over fifty percent of his income should come from the farm," and "lease land should be offered for sale to the farmers without pre-emptions by the present lease holder.[24]

Farm Implement Manufacturers and Insurance Companies

Farm implement manufacturers and insurance companies have realized that farmers are travelling long distances along roads to reach detached parcels. The advertising brochures of the Massey-Fergusion and the John Deere companies have illustrations of large farm equipment travelling on highways during the day and at night. Examples of comments, related to farm fragmentation, found in the

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[24] "In general terms leasing of public lands is preferable to putting them up for sale. If such land were available to the public, there may be a danger that speculators would offer far more than the land is worth to a working farmer or rancher, effectively forcing them out of competition and possibly negating the lands agricultural potential. However, if leased land adjacent or deeded land is essential to a viable operation, and if circumstances reveal that the purchase is more realistic than continued leasing, it is possible that the sale (directly from the public to a bona fide agricultural operation) of the lease would be a preferred alternative." (Unifarm, 1977, page 6)

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TABLE 41

THE SHORTAGE AND/OR HIGH COST OF AGRICULTURAL LAND

WHAT ARE YOUR RECOMMENDATIONS FOR EASING THE PRESENT SHORTAGE AND/OR HIGH COST OF AGRICULTURAL LAND?

RESPONSE	%
Reduce land ownership by speculators, foreigners, developers, acreage owners, and oil companies	35.5
Hutterites are forcing up land prices	22.4
Some farms have become too large, therefore limit the amount of land an individual can own	14.5
Agricultural product prices should increase relative to increases in land costs	9.2
Provide money at low interest rates for young farmers and small operations	5.3
Present land prices are satisfactory	3.9
Other	9.2

N = 76 (100.0%)
Missing Observations = 61

Total Cases = 137

brochures were:

> "MF360 can be placed into full transport mode with harrows parallel to the direction of travel for long-distance highway travel."[25]
>
> "Narrow roads, long distances between fields, and 20 foot cutting width combine to make moving from one field to the next a difficult undertaking with many swathers. Not so with a John Deere extra value pull-type. You can switch to full endways transport by yourself. In minutes. Without uncoupling the tractor, PTO, or hydraulic hoses."[26]

In addition, the John Deere company offers safety features which include a reflective, slow moving vehicle signs, and complete field, highway and safety lighting. Despite recent efforts by the implement manufacturers to improve the road worthiness of farm equipment, some farmers still utilize older equipment without the recent improvements. For further discussion, Sublett (1975) has a detailed description of what farm equipment manufacturers and tire makers have done in the United States.

Farm insurance programs are available at many insurance agencies. Some of the perils insured include theft, vandalism, and damage caused by hail, blizzards, floods, lightning, wind, collapse of bridges or culverts and collision with other vehicles. Insuring the farm operation reduces some of the risks associated with operating a fragmented farm.

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[25]Massey-Fergusion Inc. MF360 Wide Level Disc Harrow. Brochure 810AG. 1977. page 2.
[26]John Deere. Grain and Maize Combines/Grain Windrowers. Brochure A23-77-2. 1977. page 50.

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Provincial and Federal Governments

Two courses of action by which provincial and federal governments can alleviate problems arising from fragmented farms are through new taxation laws and the incorporating of farm consolidation and enlargement guidelines into regional rural development planning. Six potential areas where new taxation regulations could be employed are:

1. Increase the taxes on land owned by foreigners and individuals using the land for residential purposes or other non-agricultural pursuits.
2. Agricultural land purchased and sold within two years should have a higher tax on capital gains to reduce speculation.
3. Intensive agricultural land uses such as market gardens, feedlots, and greenhouses should have higher property taxes than less intensive land uses such as pasture land.
4. Tax all individuals or groups (for example, the Hutterite Brethren) operating an agricultural operation and utilizing the rural infra-structure primarily maintained by taxes.
5. Diminish the subdivision of agricultural land. Inheritance and gift taxes could be reduced if an entire farm is sold to one heir or individual farmer.
6. Farmers exchanging parcels to obtain land closer to the farmstead should be exempted from taxes on capital gains because of real estate transfers.

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In the Alberta context no inheritance, gift or real estate transfer tax directly exists but individuals are taxed on capital gains under the federal Income Tax Act. In addition, all property owners, including the Hutterite Brethren, in Alberta pay property tax. The tax assessment is not higher for land owned by foreigners. It is also not directly based on agricultural intensity but rather on the location and productivity of the land. Due to a recent amendment to the Canada Citizen Act the provinces have the authority to control land purchases. In Alberta, foreigners are restricted to twenty acres (8.1 hectares) of rural land unless it is for industry or development.

Farm consolidation or remembrement schemes have been introduced in India (Shetty, 1963; Zaheer, 1975) and in many European countries (Binns, 1953; Jacoby, 1959; Naylon, 1959; Moral-Lopez and Jacoby, 1962; DeBarros, 1963; Lambert, 1963; and Clout, 1974). It was not until 1965 that Canada under the Agricultural and Rural Development Act (A.R.D.A.) established a Federal-Provincial Farm Consolidation and Enlargement Program. In addition, A.R.D.A. in January of 1966 sponsored a conference on Canadian farm consolidation and enlargement. Farm consolidation and enlargement programs have since 1966 been implemented in the provinces of Alberta, New Brunswick, Nova Scotia, Ontario, Prince Edward Island and Quebec (Gouvernement du Quebec, 1969; Jackson and Maxwell, 1971; Bunce, 1973; and Retson, 1974).

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The purpose of farm consolidation and enlargement programs is to increase the productivity and efficiency of the agricultural sector, and to enlarge small operations until they provide the farmer and his family with an acceptable standard of living. This purpose may be obtained by considering the following objectives:

1. Improve the spatial arrangement of individual farms through the process of consolidating scattered plots into fewer and larger parcels which are as close to the farmstead as possible.
2. Attempt to reduce the loss of land especially prime agricultural land to non-agricultural purposes.
3. Purchase farmland from uneconomical holdings as they become available for sale and hold the land in reserve until it can be reallocated to farmers adjacent to the land who are willing and able to enlarge their farms. If the accumulated land forms a block of land capable of supporting a viable operation, then it may be given to individuals wanting to begin farming.
4. Establish sources of full-time employment to absorb or attract farmers with uneconomical units.
5. Integrate the program with general rural development projects such as water management, soil erosion controls, soil improvement, land leveling and drainage, wildlife management, and the upgrading and constructing roads.

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6. Familiarize farmers with the concept of farm consolidation and enlargement by an educational program possibly sponsored by the Rural Education and Development Association.

Formulation of a farm consolidation and enlargement program requires planning and cooperation at the regional, provincial and federal levels. Implementation of the program could be regulated by a locally based supervisory committee comprised of the district agriculturalist, and representatives from the local farmers, the regional planning commission, A.R.D.A, and any other directly related agency. Financial and technical assistance could be provided by the provincial and federal governments.

In the context of southeastern Alberta there is no regional farm consolidation and enlargement program. However, the Southeast Regional Planning Commission have policies, relating to the new provincial Planning Act and Subdivision Regulations, establishing areas where country residence subdivisions may be permitted. A policy to preserve agriculturally productive land for agricultural production in viable economic units is also followed. Rural development projects such as major irrigation districts have been constructed to the west of the Hilda-Schuler District. If a farm consolidation and enlargement program for the study area is ever created, it would be necessary to consider also these irrigation districts.

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E. CONCLUSION

Discussion of Results

Results indicated that the farms had a mean number of three parcels per farm which was comparable to many of the other countries outlined in TABLE 1 in CHAPTER TWO. However, the respondents' mean parcel size of three hundred and fifty-two hectares, mean farm size of 1,015 hectares, and mean distance of nine kilometres to detached parcels from the farmstead were considerably larger than most other countries with the exception of farms in Eyre Pennisula, Australia (Hill and Smith, 1977). Within Canada, Delisle's (1978) study on farms in Manitoba indicated that the farms were smaller in mean farm size and mean parcel size but had a similar mean distance to parcels. According to Ironside (1979), farms in southern Ontario had fifty percent of the parcels within five kilometres of the farmstead and seventy percent of the parcels were up to forty hectares in size. In Alberta, approximately forty-nine percent of Boylen's (1976) respondents had detached parcels with sixty-six percent between zero and eight kilometres away from the farmstead. Whereas, sixty-four percent of the respondents in this study had detached parcels and seventy-one percent were within eight kilometres of the farmstead.

Seventy-four percent of Sahir's (1977) sample of two hundred and sixty-five farmers in Saskatchewan were resident farmers. These resident farmers had the largest mean farm

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size, the highest percentage of owner/tenants, and less off-farm employment as compared to seasonal and non-farm residents. These results are comparable to findings of the author's study.

Several authors referred to farmers transporting agricultural products to storage facilities left on the parcel at the site of the labour thereby reducing travel time and costs. The Hilda-Schuler farmers were found to have granaries, quansets, and fuel tanks on parcels other than the farmstead.

Many of the effects of farm fragmentation mentioned by the Hilda-Schuler farmers were, as expected, much the same as those discussed in the literature review. However, in many European and Asian countries the introduction of mechanized agriculture and legally demarcated fields were problems associated with farm fragmentation but apparently the Hilda-Schuler farmers were not plagued with these problems.

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Summary

Approximately ninety-three percent of the farms were fragmented by either fragmenting the residential location and/or farmland. Land fragmented farms had a mean size almost four times the mean size of the consolidated farms. At least eighty-one percent of the farmers had fragmented farmland of which seventy-eight percent operated detached parcels. There were three hundred and ninety-five parcels including consolidated, farmstead, corner-touching,

detached, and road or rail separated parcels. They ranged in size from less than sixty-five hectares to over 4,144 hectares and had a mean size of three hundred and fifty-two hectares. Although one farm comprised ten parcels, the mean was three parcels per farm. Owner/tenants accounted for eighty-three percent of all the land fragmented farms and in general, had larger farms than the owners or tenants. It was hypothesized that the number of parcels operated increased with the size of the farm. A statistically significant relationship was not found, however, it appeared that farms with more parcels had a larger mean farm size.

Ninety-one percent of the detached parcels were within sixteen kilometres of the farmstead and had a mean distance of about nine kilometres away from the farmstead. Detached parcels at a distance greater than 1.6 kilometres seemed to increase in mean size. As the distance increased from the farmstead, it appeared that the detached parcels had, in general, a decline in the percentage of land ownership and a change in the type of land use from arable to pasture. The most common reason given by farmers explaining why the detached parcels had a different land use than the farmstead was that they wanted to diversify the farm operation. When the farmers were asked how often the detached parcels were fertilized almost sixty percent stated that they did not utilize fertilizer. Although the above results indicated definite trends, all four relationships mentioned in hypothesis three were statistically non-significant.

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Seven farmers were seasonal residents, twenty-nine were non-farm residents and a majority of the farmers resided on the farm. Most of the seasonal and non-farm residents were able to take advantage of the social, economic and educational amenities offered by an urban centre such as Medicine Hat, Calgary and Edmonton. Over sixty-eight percent of the farmers with off-farm employment had a residence off the farm. Medicine Hat was the most common centre of off-farm employment. Eighty-three percent of the non-farm residents and fifty-seven percent of the seasonal residents had grain farms, while seventy-eight percent of the resident farmers had both livestock and crops. Resident farmers had a larger mean farm size than seasonal and non-farm residents.

Besides land and residential fragmentation, two other forms of fragmentation were evident. Dispersed storage facilities for agricultural products and implements appeared to be a common practice among the Hilda-Schuler farmers. Sixty-nine farmers were members of grazing associations which enabled them to increase herd size without purchasing additional land, however, the livestock were then fragmented from the farm.

Various types of farm implements such as tractors, grain trucks, swathers, and combines were moved by farmers to detached fields. Over seventy percent of the farmers experienced increased wear and tear on machinery driven on paved or gravel roads. Slow moving, large farm implements on public roads create a traffic hazard especially when they

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extend into the oncoming lane. Most of the farmers with detached parcels had no theft or vandalism to property and no scheduling difficulties.

Land adjacent to the farmstead may not be available for sale or rent and may have a higher market price than a distant parcel, therefore the acquisition of detached parcels enables the farmer to enlarge his operation at an affordable price. Furthermore, dispersed parcels increase the probability of catching scattered showers, decrease the risk of damage to agricultural products due to localized environmental hazards, and may be of better soil quality.

Farmers, private companies and various levels of government are capable of reducing some of the disadvantages associated with farm fragmentation. This can be accomplished by farmers exchanging parcels with other farmers to acquire land closer to the farmstead. In addition, Excessive wear and tear on implements and travel time can be reduced by travelling in a half-ton truck to reach machinery left on distant parcels. If moving farm machinery is necessary, this could be scheduled during the day thus avoiding peak traffic hours and diminishing the risk of becoming a traffic hazard. Moving implements on public roads has become safer since farm equipment manufacturers introduced hydraulic folding equipment. Farmers should take appropriate security measures and obtain farm insurance to reduce the losses due to theft and vandalism to property.

Provincial and federal governments could introduce

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changes in the taxation laws related to provincial property taxation, and capital gains under the Income Tax Act which may alleviate some of the disadvantages of farm fragmentation. Furthermore, farm consolidation and enlargement programs could be formulated and implemented at the regional, provincial and federal levels.

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VII. CHAPTER SEVEN

SUMMARY AND CONCLUSIONS

In this chapter, the objectives and hypotheses are restated and the major findings are summarized. Limitations of the study are set forth, together with recommendations of ways future researchers might avoid these shortcomings. This is followed by a brief discussion on the results of the thesis. Finally, suggestions for further research are provided.

A. SUMMARY

Objectives of the Study

There were four objectives established for the thesis. The first objective was to define and examine the nature of farm fragmentation. For the purposes of this thesis, an agricultural holding was defined as an area of land operated as an integrated functioning system and decision-making unit, by an operator or operators, having more than one acre (.4 hectares) and sales of agricultural products exceeding fifty dollars in the previous twelve months. Furthermore, the farm had two components: the land holdings either owned, rented or managed, and the operational headquarters which consisted of the residence and the fixed and mobile investments. Whenever all the land and operational headquarters were not consolidated, there existed a fragmented farm.

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The second objective was to indicate the relative extent and pattern of fragmented farms in the study area in 1977. Analysis of the results indicate that ninety-three percent of the questionnaire respondents had fragmented farms. At least eighty-one percent of the farmers operated fragmented farmland of which seventy-eight percent had detached parcels. Seven farmers were seasonal residents, twenty-nine were non-farm residents and the remaining one hundred and one farmers resided on the farm. It appeared that many of the farmers fragmented fixed and mobile investments such as granaries. Three hundred and fifty-two hectares was the mean parcel size and the mean farm size was 1,014 hectares.

Determining the causes and implications of farm fragmentation in the study area was the third objective. Land availability was the most common reason cited for renting instead of purchasing land and having detached parcels instead of land adjacent to the farmstead. Land prices were considered to be too high. Most of the farmers did not plan on selling any portion of their farm in the next five years, wanted their children to take over the farm, wanted to expand their farm operation, and were willing to pay a higher price for land adjacent to the farmstead. These results indicate a demand for a limited supply of farm land. Proximity to off-farm employment, school needs of the children, and semi-retirement were the main reasons for seasonal and non-farm residents residing

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off the farm. Out of twenty-two farmers with off-farm employment, fifteen were seasonal and non-farm residents and most had below average farm sizes.

Convenience was the main suggested reason for consolidating land holdings instead of having scattered parcels. The farmers cited wear and tear on implements, increased production costs, and wasted time and energy in transporting machinery as disadvantages of operating dispersed parcels. Transporting large farm implements on public roads create a traffic hazard if they extend into the oncoming lane. Although theft, vandalism and scheduling difficulties are often problems associated with fragmented farms, most of the farmers did not experience these difficulties. Some of the disadvantages with tiny, irregular shaped fields like those in European countries were not encountered because the Hilda-Schuler district had incomparably larger, legally demarcated, and mechanized farms. Besides the disadvantages reported, there were advantages to farm fragmentation. Land adjacent to the farmstead may not have been available for sale or rent, or had a higher market price than a distant parcel. Therefore, the acquisition of detached parcels enabled the farmer to expand his operation at an affordable price to meet rising production costs or to improve his standard of living. In addition, dispersed parcels increase the probability of catching scattered showers and avoiding localized environmental hazards such as hail. A detached parcel may be

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of better soil quality. Farmers residing within an urban centre are able to take advantage of the economic, educational, and social amenities offered by an urban centre.

The final objective was to investigate some of the behavioural aspects of operating fragmented farms. Farmers' opinions on the attitude statements (See TABLE 9 or APPENDIX B) indicated: agreement with statements concerning land ownership rights (1,4); financial benefits of renting (5,9), risk and uncertainty in renting (11, 17, 22), controlled urban expansion and foreign ownership (14, 16), success without formal education (10), reduced operating costs for resident farmers (15), and government financial assistance (20); and disagreement with statements about the unlimited supply of farmland in Alberta (3), city life being better than farm life (6), renting only when lacking the finances to buy (12), the time wasted keeping farm records (18), and Hutterites purchasing land (21). Attitudes related to inadequate leasing markets (7), land as a community resource (2), owning land means less money spent in the long run (13), and farming efficiency (8, 19) were scored as undecided. Results to several of the behavioural questions were previously discussed under the third objective. Findings of other behavioural questions appeared to indicate that the tenants preferred crop-share and long term agreements. Many of the farmers shopped for consumer goods in the city of Medicine Hat. The farmers, in general, were

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willing to travel longer distances for larger land parcels.

Hypotheses

Four hypotheses, based on the literature reviewed, were proposed and they were:

1. The opinions, using Likert attitude measurement scales, of the farmers in the Hilda-Schuler district towards attitude statements will correlate a) positively with the greater the past farming experience, the higher the age grouping, farmers operating detached parcels, the greater the number of children, the higher the formal education level, and the greater the sources of information; and b) negatively with the higher the income level, and residency on the farm.

2. That the number of parcels operated will increase with the size (in hectares) of the farm.

3. That as the distance increases from the farmstead a) the parcel size will increase, b) the type of production at the detached parcel will change (arable to pasture), c) the percentage of land ownership will decrease, and d) the frequency of fertilizer input will decline.

4. That resident farmers, as compared to seasonal and non-farm residents, will a) have a higher gross family income, b) be of a younger age, c) have a larger farm size, d) have a lower percentage of their land rented, and e) have less off-farm employment.

A summary of the results are presented below.

Responses to all the attitude statements (See TABLE 9 or APPENDIX B) were cross-tabulated with the farmers' residence pattern, whether or not the farms had detached parcels, and the farmers' socio-personal characteristics. This resulted in no statistically significant relationships. Cell depletion and similarity among the farmers were reasons for the associations being rejected. A majority of the

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farmers were German, married, raised on a farm, had between seven and thirteen years of schooling, had farmed in the Hilda-Schuler area, were resident farmers, and operated fragmented farmland. Because attitudes are influenced by inculcation by peers, parents or reference groups, and prevailing social attitudes, the farmers opinions' may have represented a 'norm' response by a well integrated agricultural community. The farmers' opinions, for example, toward risk and uncertainty, land availability, and controlled foreign land ownership and urban expansion, appeared to support other findings of this study.

Both hypotheses two and three were statistically non-significant but definite trends were visible implying other variables were influencing the relationships. There appeared to be a trend for farms with more parcels to have a larger mean farm size. Fragmented farms had farmsteads with a mean parcel size almost twice the mean size of consolidated farms. Farmers may try to acquire land adjacent to other parcels and therefore, may not increase the number of parcels but increase the farm size.

Nine kilometres was the mean distance to the detached parcels and ninety-one percent of the detached parcels were within sixteen kilometres of the the farmstead. There were no steady increases in the mean sizes of the detached parcels as distance increased from the farmstead. Detached parcels at a distance greater than 1.6 kilometres tended to increase in mean size. This trend was similar to the

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farmers' responses to how far they would be willing to travel from the farmstead for various sizes of parcels. As distance increased from the farmstead, it appeared that the detached parcels had, in general, a decline in the percentage of land ownership and a change in the type of land use from arable to grazing. In addition, the percentage of land rented seemed to increase as the amount of land in pasture increased. A possible explanation for the increase in pasture and renting is that most of the farmers operated provincial grazing leases in which the regulated land use was pasture.

Attempts at determining if the frequency of fertilizer input declined over distance were unsuccessful because many of the farmers reported that they did not use fertilizer. One farmer stated that fertilizers were not applied because the study area receives insufficient moisture to utilize fertilizer effectively.

The association between the farmers' residence pattern and age and gross family income level were statistically significant at the .05 level of significance, but the residence pattern was non-significant with farm size, percentage of land rented, and off-farm employment. As the farmers' age increased the percentage of resident farmers declined but conversely, as the gross family income level increased the percentage of resident farmers increased as compared to the non-farm residents. Analysis of the non-significant relationships did, however, present some

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interesting results. Resident farmers and non-farm residents on average rented more land than they owned as compared to seasonal residents who rented less. Seasonal and non-farm residents had a mean farm size less than one half the mean farm size of the resident farmers. Only seven out of twenty-two farmers with off-farm employment were resident farmers of which most received less than thirty percent of their income off the farm.

In the process of exploring the relationships outlined in the hypotheses, four other statistically significant associations were discovered. They were a negative correlation between the farmers' age and his willingness to expand and if he was searching for land to own; and a positive correlation between the farmers' willingness to expand if he was searching for land to own, and to rent or lease.

A secondary purpose of the study was to ascertain ways through which the farmers, private sector and government agencies could be able to alleviate the disadvantages of fragmented farms. Examples of what the farmers could do are: exchange parcels with other farmers to acquire land closer to the farmstead, reduce wear and tear on machinery and diminish travel time and costs by travelling in a half-ton truck to reach machinery left on distant parcels with unfinished fieldwork, avoid moving machinery during peak traffic hours, and acquire farm insurance. Farm equipment manufacturers have improved the road worthiness of new

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implements. Two proposals that should be given consideration by the provincial and federal governments are the introduction of new taxation laws in areas such as provincial property taxation, and capital gains under the Income Tax Act; and the integration of farm consolidation and enlargement guidelines into rural and regional planning. The purpose of farm consolidation and enlargement programs is to increase the productivity and efficiency of the agricultural sector, and to enlarge non-viable farms in order that the farmer and his family have an acceptable standard of living.

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B. CONCLUSIONS

Limitations of the Study

Data on the number of acres owned or leased by each individual or group who had an interest in the land in the study area were provided by the farmland assessment sheets, tax assessment rolls and lease records. These files proved to be an excellent source of information. To obtain social, economic, attitudinal and behavioural data on individual farmers and farm operations, a dropped-off, mail-back questionnaire was utilized. Although these methods of data collection were quite effectual, several problems arose. The questionnaire collected some unnecessary information on land use and on land leased from the government. Detailed data on land leased from the government was available in the tax assessment and lease records, and in government pulications

such as the Administration of Alberta Public Lands (Alberta, Energy and Natural Resources, 1979). Farmland assessment sheets included information on the number of acres in pasture and in crop for each quarter section of land. Therefore, questions related to land use could have concentrated on why the parcels had a certain land use. Because access to the tax and farmland assessment records was not guaranteed, the additional questions were included in the questionnaire, and later, it was found that the information was useful for checking the validity of the farmers responses.

A pre-test of fifty respondents was sufficient to reveal most of the ambiguous and irrelevent questions that existed in the questionnaire. Two questions in the final questionnaire, however, could have been improved. The term 'separation', in question thirty-one of section B, could be a separate category in order to provide a better indication of the number of married couples. Question nine of section C needs rewording because it seems inappropriate to consider 'widow' as an occupation.

Although the final response rate (137 of 355 farm units) of the questionnaire was reasonably good, a larger reply such as two hundred and fifty farm units was necessary to avoid the problem of cell depletion - more than twenty percent of the cells with expected values below five when testing for statistical significance. A higher response rate may have been attained during the administration of the

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final questionnaire if more time and energy was spent contacting all the potential respondents. Researchers, however, are confronted with time and financial constraints.

Another limitation of the study was the strong bias caused by an abundance of farm fragmenters. Farmland fragmenters outnumbered the consolidated land holders, and there were too many resident farmers as compared with seasonal and non-farm residents. If the number of respondents in the groups were more equally distributed, then a better comparison between the groups, such as differences in attitudes, may have been obtained.

In this thesis, the operational centre was defined as being fragmented when it was divided and located on different parcels or in a nucleated settlement. There is, however, the possibility of having scattered storage facilities on consolidated farmland. Therefore, researchers may wish to consider this a mild and possibly beneficial form of fragmentation.

When determining the distances travelled by farm fragmenters, two changes should have occurred in the calculations. It was assumed that there were direct crossing points between barrier separated parcels and the farmstead, thereby causing the amount of road travel to be negligible. Instead the distance necessary to cross or bypass the barrier should be determined possibly by questioning the farmer or by examining aerial photographs. Furthermore, additional data should have been collected on the distances

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travelled by seasonal and non-resident farmers to reach their farmsteads. This data would provide a more accurate indication of distances travelled by farm fragmenters.

Discussion of Results

Findings of this study are significant because they substantiate a majority of the findings on previous research on farm fragmentation. There were, however, several findings contrary to the results of similar studies. Since a discussion of results was provided at the conclusion of each analysis chapter, chapters five and six, only the contradictory findings are briefly reviewed. In contrast to Boylen's (1976) findings, the Hilda-Schuler farmers' replies to the attitude statements displayed a capitalistic philosophy on selling land, considered land ownership as a means of having land to farm, and were of the opinion that the supply of land for farming is limited. Findings which supported these opinions were: the main reason for renting was that the land was not for sale, a majority of the farmers did not plan on selling any portion of their farm in the next five years and were willing to pay more for adjacent, land availability was the main reason for having detached parcels, and the farmers implied that speculators, foreigners and the Hutterites were increasing land prices. Therefore, it is recommended that further research be conducted on farmers' attitudes towards land availability and land ownership to determine if the results of this study are representative of Alberta farmers.

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Most of the Hilda-Schuler farmers preferred the long term agreements which was contradictory to Boylen's results. Because many of the farmers operated land leased from the provincial government and ten to twenty year leases are available, the Hilda-Schuler farmers may have come to expect long term agreements. Research should be undertaken to determine if farmers with government leased land exhibit different agreement preferences than farmers without leased land.

An aim of the study was to test if fertilizer application and the intensity of cultivation was a negative function of distance from the farmstead. Supposedly due to the semi-arid climate of the study area many of the farmers did not apply fertilizers, therefore, the author was unable to determine if a distance decay effect existed with fertilizer application. Although the type of land use appeared to change from arable to pasture as distance increased from the farmstead, the relationship was not statistically significant. The three main reasons for the detached parcels having a different land use than the farmstead were to diversify the farm operation, land quality, and provincial land use regulations on leased land. More attention is needed on the influence that provincial land use regulations have on the agricultural landscape.

Sahir (1977) and Edwards (1978) proposed that there was a positive correlation between farm size and the number of parcels. Hill and Smith (1971) and Igbozurike (1976),

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however, suggested that other factors besides farm size influence the number of parcels in a farm. Results of this study found no statistically significant relationship between farm size and the number of parcels. The method of determining the number of parcels in a farm may have been different from other studies and therefore, the findings of this study may not be comparable.

This study is significant for another reason. It provides another geographical study and useful information on farm fragmentation to reduce the dearth of empirical research and paucity of information on farm fragmentation in Canada. Potential research areas are dicussed next.

Recommendations for Further Research

Considering the results of this study there appeared to be several areas of potential research. Conclusions drawn from this study should be tested by similar studies in other economic, social, and physical environments of Alberta and Canada before any widespread generalizations are developed. Further research is needed to determine if the extent and effects of farm fragmentation vary according to different types of agricultural operations. Dairy farms, requiring a relatively even workload throughout the year, may experience less residential fragmentation than grain farms which tend to demand most fieldwork during planting and harvesting seasons.

In this study, it appeared that the Hilda-Schuler farmers had dispersed storage facilities for farm products

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and implements. More attention is needed regarding the extent, location and types of storage facilities on parcels other than the farmstead.

Another area which requires research is the travel patterns by resident farmers to detached parcels and by seasonal and non-farm residents to detached and farmstead parcels. In addition, more intensive research on the supply and destination points of agricultural inputs and outputs should be undertaken to reveal the routes and distances travelled by farmers. Data on travel patterns would contribute to the estimation of travel time and costs incurred by farm fragmenters, and may assist transportation planners in improving the local road network.

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One of the reasons given for particular land uses on detached parcels was the land use regulations on government lease land. Many of the Hilda-Schuler farmers operated land leased from the provincial government. Furthermore, the farmers appeared to be in favour of limiting urban expansion and foreign land ownership. Therefore, the actual and potential influence that government policies or regulations have on farm fragmentation may be worth future study.

There appeared to be economic costs and benefits associated with farm fragmentation. A cost/benefit analysis should be conducted to expose the economic costs or monetary savings of operating a fragmented farm. Several questions could be investigated. What are the economic benefits of residing in an urban centre as opposed to living on a grain

or livestock farm? What is the rate of increase in travel expenses as distances increase between parcels?

Further research should examine the farmers' attitudes towards farm consolidation and enlargement schemes. As well, more research is required to evaluate the success and failure of consolidation and enlargement programs employed in Canada and possibly other countries. This research in conjunction with data on the extent, causes and implications of Canadian farm fragmentation will enable rural and regional planners to better understand the structure of Canadian farms, and to develop strategies to improve agricultural efficiency, resource utilization, and the standard of living of the rural population.

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APPENDIX A

Flora and Fauna of Southeastern Alberta

University of Alberta

FLORA

PLAINS

Alkali Grass (Distichlis stricta)
Annual Sunflower (Helianthus petiolaris)
Blue Grama Grass (Bouteloua gracilis)
Broomweed (Gutierrezia sarothrae)
Buffalo Bean (Thermopsis rhombifolia)
Buffalo Berry (Sheperdia argentea)
Canada Wild Rye (Elymus canadensis)
Choke Cherry (Prunus virginiana)
Club Moss (Selaginella densa)
Common Bluebell (Campanula rotundifolia)
Common Cattail (Typha latifolia)
Common Juniper (Juniperus communis)
Common Ragweed (Ambrosia artemisiifolia)
Common Spear Grass (Stipa comata)
Cottonwood (Populus sargentii)
Creeping Juniper (Juniperus horizontalis)
Cushion Milk Vetch (Astragalus triphyllus)
Cushion Cactus (Mamillaria vivipara)
Dandelion (Taraxacum officinale)
Early Cinquefoil (Potentilla concinna)
Early Yellow Loco-week (Oxytropis sericea)
Evening Primrose (Oenothera)
Flowering-quilwort (Lilaeaceae scillioides)
Foxtail Barley (Hordeum jubatum)
Golden Aster (Chrysopsis villosa)
Goldenrod (Solidago pruinosa)
Gumweed (Grindelia squarrosa)
Greasewood (Saracobatus vermiculates)
Indian Rice Grass (Oryzopsis hymenoides)
June Grass (Koeleria cristata)
Lance-leaved Orache (Atriplex patula)
Narrow-leaved Water Plantain (Alisma gramineum)
North Wheat Grass (Agropyron dasystachyum)
Owl Clover (Orthocarpus luteus)
Pasture Sage (Artemisia frigida)
Prairie Buttercup (Ranunculus rhomboideus)
Prairie Cord Grass (Spartina pectinata)
Prairie Crocus (Amenone patens wolfgangiana)
Prairie Onion (Allium textile)
Prickly Pear Cactus (Opuntia polyacontha)
Rabbit Bush (Chrysothamnus nauseosus)
Rabbitfoot Grass (Polypogon monspeliensis)
Russian Thistle (Salsola kali tenuifolia)
Sagebrush (Artemsia cana)
Saskatoon (Amelanchier alnifolia)
Sandberg's Blue Grass (Poa secunda)
Scarlet Mallow (Sphaeralcea coccinea)
Scratch Grass (Muhlenbergia asperifolia)
Silver Saltbush (Atriplex argentea)
Skunk Bush (Rhus trilobata)
Spanish Bayonet (Yucca glauca)
Tall Beggar-ticks (Bidens vulgata)
Tansy Mustard (Descurainia sophia)
Three-flowered Avens (Geum triflorum)
Western Blue-bur (Luppula redowskii)
Western Clematis (Clematis liguisticifolia)
Western Wheat Grass (Agropyron smithii)
Wild Begonia (Rumex venosus)
Wild Gaillardia (Gaillardia aristata)
Wild Oat (Avena fatua)
Wild Rose (Rosa woodsii)
Wolf Willow (Eleagnus commutata)
Yellow Prairie Violet (Viola nuttallii)

CYPRESS HILLS

Aspen Popular (Populus tremuloides)
Balsam Popular (Populus balsamifera)
Bluebunch Fescue (Festuca idahoensis)
Common Nettle (Utica gracilis)
Calypso Venus Slipper (Calypso bulbosa)
Fringed Brome (Bromus ciliatus)
Lodgepole Pine (Pinus contorta latifolia)
Mountain Timothy (Phleum alpinum)
Northern Awnless Brome (Bromus pumpellianus)
Purple Reed Grass (Calamagrostis)
Pussy-toes (Antennaria corymbosa)
Rough Fescue (Festuca scabrella)

FAUNA

MAMMALS

Pale Big-eared Bat (Myotis evotis)
White-tailed Prairie Hare (Lepus townsendii campanius)
Black Hills Cottontail Rabbit (Sylvilagus nuttalii grangeri)
Richardson Ground Squirrel (Citellus richardsonii)
Thirteen-lined Ground Squirrel (Citellus tridecemlineatus)
Anderson Pocket Gopher (Thomomys talpoides andersoni)
Maximilian Pocket Mouse (Perognathus fasciatus)
Montana Kangaroo Rat (Dipodomys ordii)
Canada Beaver (Castor canadensis canadensis)
Osgood White-footed Mouse (Peromyscus maniculatus osgoodi)
Audubon Grasshopper Mouse (Onychomys leucogaster)
Pallid Vole (Lemmiscus curtatus)
Badlands Meadow Vole (Mocrotus pennsylvanicus insperatus)
Great Plains Muskrat (Ondatra zibethicus)
Say Masked Bat (Myotis subulatus)
Black-footed Ferret (Mustela nigripes)
California Porcupine (Erethizon dorsatum epixanthum)
Prairie Coyote (Canis latrans)
Northern Plains Red Fox (Vulpes fulva regalis)
Prairie Long-tailed Weasel (Mustela frenata longicauda)
American Badger (Taxidea taxus taxus)
Northern Plains Skunk (Mephitis mephitis hudsonica)
Pallid Barred Bobcat (Lynx rufus pallescens)
American Wapiti (Cervus canadensis)
Rocky Mountain Mule Deer (Odocoileus hemionus)
Dakota White-tailed Deer (Odocoileus virginianus dacotensis)
American Pronghorn Antelope (Antilocapra americana)

FISH

Goldeye (Hiodon alosoides)
Walleye (Stizostedion vitreum)
Lake Sturgeon (Acipenser fulvescens)
Rainbow Trout (Salmo gairdneri)
Northern Pike (Esox lucius)
Longnose Dace (Rhinichthys cataractae)
Flathead Chub (Platygobio gracilis)
Lake Chub (Couesius plumbeus)
Pearl Dace (Semotilius margarita)
Northern Redbelly Dace (Chrosomus eos)
Flathead Minnow (Pimephales promelas)
Emerald Shiner (Notropis altherinoides)
River Shiner (Notropis blennius)
Spottail Shiner (Notropis hudsonis)
Brassy Minnow (Hybognathus hankinsoni)
Silvery Minnow (Hybognathus nuchalis)
Quilback (Carpiodes cyprinus)
Northern Redhorse (Moxostoma macrolepidotum)
Longnose Sucker (Catostomus catostomus)
White Sucker (Catostomus commersoni)
Stonecat (Noturus flavus)
Burbot (Lota lota)
Trout Perch (Percopsis omiscomaycus)
Brook Stickleback (Culaea inconstans)
Yellow Perch (Perca flavescens)
Iowa Darter (Etheostoma exile)
Sauger (Stizostedion canadense)

REPTILES AND AMPHIBIANS

Tiger Salamander (Ambystoma tigrinum melanostictum)
Plains Spadefoot Toad (Scaphiopus bombifrons)
Boreal Chorus Frog (Pseudacris triseriata maculata)
Leopard Frog (Rana pipiens)
Bullsnake (Pituophis catenifer)
Prairie Rattlesnake (Crotalus viridus)
Plains Western Garter Snake (Thamnophis radix haydeni)
Red-sided Garter Snake (Thamnophis sirtalis)

INSECTS

Clear Winged Grasshopper (Camnula pellucida)
Two Striped Grasshopper (Melanoplus bivattatus)
Scorpion (Boreus californicus fuscus)
Prairie Grain Wireworms (Ctenicera aeripennis destructor)
Cattle Grub (Hypoderma lineatum)
June Beetles (Phyllophaga spp.)
Boxelder Bug (Leptocoris trivittatus)
Mosquitoes (Aedes vexans, and Aedes dorsalis)

FAUNA (Continued)

BIRDS

Baldpate (Mereca americana)
Horned Grebe (Podiceps auritis)
Eared Grebe (Podiceps caspicus)
Great Blue Heron (Ardea herodias herodias)
American Bittern (Botaurus lentiginosus)
Whistling Swan (Olar columbianus)
Canada Goose (Branta canadensis)
Mallard (Anas platyrhynchos platyrhynchos)
Gadwall (Anas strepera)
American Pintail (Anas acuta tzitzihoa)
Green-winged Teal (Anas carolinensis)
Blue-winged Teal (Anas discors)
American Widgeon (Mareca americana)
Shoveler (Spatula clypeata)
Redhead (Aythya americana)
Canvasback (Aytha valisineria)
Lesser Scaup (Aytha affinis)
Ruddy Duck (Oxyura jamaicensis rubida)
Turkey Vulture (Cathartes aura)
Red-Tailed Hawk (Buteo jamaicensis)
Swainson's Hawk (Buteo swainsoni)
Ferruginous Hawk (Buteo regalis)
Golden Eagle (Aquila chrysaëtos canadensis)
Marsh Hawk (Circus cyaneus hudsonius)
Prairie Falcon (Falco mexicanus)
Peregrine Falcon (Falco peregrinus)
Richardson Pigeon Hawk (Falco columbarius richardsonii)
Eastern Sparrow Hawk (Falco sparverius sparverius)
Sharp-tailed Grouse (Pedioecetes phasianellus)
Ring-necked Pheasant (Phasianus colchicus)
European Grey Partridge (Peridix peridix peridix)
Sora Rail (Porzana carolina)
American Coot (Fulica americana)
Killdeer (Charadrius vociferus)
Common Snipe (Capella gullinago)
Long-billed Curlew (Numensius americanus parvus)
Buffalo-head (Glaucionetta albeola)
White-winged Scoter (Melanitta fusca)
Grey Ruffed Grouse (Bonasa umbellus umbelloides)
Sage Hen (Centrocercus urophasianus)
Greater Yellow-legs (Totanus melanoleucus)
Wilson's Phalarope (Steganopus tricolor)
California Gull (Larus californicus)
Ring-billed Gull (Larus delanarensis)
Franklin Gull (Larus pipixcan)
Linnaean Common Tern (Sterna hirundo hirundo)
American Black Tern (Chidonias nigra surinamensis)
Western Mourning Dove (Zenaidura macroura marginella)
Black-billed Cuckoo (Coccyzus erythropthalmus)
Great Horned Owl (Bubo virginianus)
Western Burrowing Owl (Speotyto cunicularia hypugaea)
Western Long-eared Owl (Asio otus tuftsi)
Northern Short-eared Owl (Asio flammeus flammeus)
Common Nighthawk (Chordeilus minor)
Ruby-throated Hummingbird (Archilochus colubris)
Western Belted Kingfisher (Magaceryle alcyon caurina)
Eastern Belted Kingfisher (Magaceryle alcyon alcyon)
Say Phoebe (Sayornis phoebe)
Least Flycatcher (Empidonax minimus)
Horned Lark (Eremophila alpestris)
Tree SWallow (Iridoprocne bicolor)
Bank Swallow (Riparia riparia)
Rough-winged Swallow (Stelgidopteryx ruficollis serripennis)
American Barn Swallow (Hirundo rustica erythrogaster)
Cliff Swallow (Petrochelidon pyrrhoonta)
Black-billed Magpie (Pica pica hudsonia)
Common Crow (Corvus brachyrhynchos brachyrhynchos)
Black-capped Chickadee (Parus atricapillus septentrionalis)
Red-breasted Buthatch (Sitta canadensis)
Western House Wren (Troglodytes aëdon parkmani)
Common Rock Wren (Salpinctes obsoletus obsoletus)
Catbird (Dumetella carolinensis)
Brown Thrasher (Toxostoma rufum)
Robin (Turdus migratorius)
Long-billed Dowitcher (Limnodromus griseus scolopaceus)
Northern Hairy Woodpecker (Dendrocopos villosus septentrionalis)
Northern Downy Woodpecker (Dendrocopos pubescens medianus)
Eastern Kingbird (Tyrannus verticalis)
Arkansas Kingbird (Tyrannus tyrannus)
Willow Thrush (Hylocichla fuscescens salicicola)
Eastern Warbling Vireo (Vireo gilvus gilvus)
Mountain Bluebird (Sialia currucoides)

FAUNA (Continued)

BIRDS (continued)

Yellow-breasted Chat (Icteria virens)
American Redstart (Setophaga ruticilla)
English Sparrow (Passer domesticus domesticus)
Western Meadowlark (Sturnella neglecta)
Yellow-headed Blackbird (Xanthocephalus xanthocephalus)
Red-winged Blackbird (Agelaius phoeniceous arciolegus)
Baltimore Oriole (Icterus gulbula)
Common Grackle (Quiscalus quiscalus)
Brown-headed Cowbird (Molothrus ater)
Pale Goldfinch (Spinus tristis pallidus)
Rufous-sided Towhee (Pipilo erythrophthalmus)
Lark Bunting (Calamospiza melanocorys)
Savannah Sparrow (Passerculus sandwichensis)
Baird's Sparrow (Ammodramus bairdii)
Vesper Sparrow (Pooecetes gramineus)
Clay-colored Sparrow (Spizella pallida)
Song Sparrow (Melospizza melodia juddi)
McCowan's Longspur (Rhynchophanes mccownii)
Pacific Audubon Warbler (Dendroica auduboni auduboni)
Black-throated Green Warbler (Dendroica virens virens)
Bay-brested Warbler (Dendroica costanea)
Black-poll Warbler (Dendroica striata)
Oven-bird (Seiurus aurocapillus)
Macgillivray Warbler (Oporonis tolmiei)
Loggerhead Shrike (Lanius ludovicianus)
Long-tailed Chat (Icteria virens auricollis)
Wilson Warbler (Wilsonia pusilla pusilla)
Bullock Oriole (Icterus bullockii bullockii)
Brewer Blackbird (Euphagus cyanocephalus)
Rose-breasted Grosbeak (Pheucticus ludovicianus)
Lazuli Bunting (Passerina amoena)
Common Redpoll (Acanthis flammea flammea)
Northern Pine Siskin (Spinus pinus pinus)
Bendire Red Crossbill (Loxia curvirostra bendirei)
Western Grasshopper Sparrow (Ammodramus savannarum perpallidus)
Western Lark Sparrow (Chondestes grammacus strigatus)
Pink-sided Junco (Junco oregannus mearnis)
Western Chipping Sparrow (Spizella passerina arizonae)
Brewer Sparrow (Spizella breweri breweri)
Oregon White-crowned Sparrow (Zonotrichia leucophrys oriantha)

For a more complete listing and description of the flora and fauna in Southeastern Alberta, the following references are recommended:

Best, K.F., Looman, J., and Campbell, J.B. 1971. Prairie Grasses, Publication 1413. Ottawa: Canada Department of Agriculture. 1971. 237 pp.

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APPENDIX B

Introductory Letter, Questionnaire, and Follow-up Letter

University of Alberta

DEPARTMENT OF GEOGRAPHY
TELEPHONE (403) 432-3274

THE UNIVERSITY OF ALBERTA
EDMONTON, CANADA T6G 2H4

November 16, 1978

Dear Sir/Madam:

The following letter is to introduce you to a survey on rural land tenure. Information collected through this questionnaire will be used for a thesis, which is part of my requirements in obtaining a Master's degree at the University of Alberta. The purpose of this survey is to determine the present landuse, land ownership and leasing arrangements in Southeastern Alberta. The results of the survey will be presented in the thesis, but the individual responses on which it is based will be kept in confidence, and will not be made available to any government or public agency. I hope that the study will help bring about better government policies with respect to the ownership and leasing of land in Southeastern Alberta.

Many questions require only a check mark (✓) at the response that applies to you. For some questions, however, answers are not listed and a blank area is left so that you can reply in your own words. To answer this survey will only take approximately 30 minutes. If you wish to comment on any statement, please feel free to use the space provided at the end of the questionnaire.

The success of any survey like this depends upon the cooperation of everyone. Your completion of the questionnaire as soon as possible will be greatly appreciated. Please return it to me in the enclosed stamped addressed envelope.

Thank you.

Yours sincerely,

Gordon K. Willis

Gordon K. Willis

RURAL LAND TENURE SURVEY

CONFIDENTIAL

SECTION A

We are interested in your reaction to the following statements. For each of the following statements please place a check mark (✓) to show whether you strongly agree, agree, undecided, disagree, or strongly disagree.

	strongly agree	agree	undecided	disagree	strongly disagree
1. The owner has the right to sell his land for a profit.....	____	____	____	____	____
2. Land is a community resource.....	____	____	____	____	____
3. The supply of land for farming in Alberta is unlimited.....	____	____	____	____	____
4. Land ownership gives the freedom to farm the land without interference from government regulation.....	____	____	____	____	____
5. Renting land can free capital for other investments.....	____	____	____	____	____
6. City life is better than farm life.....	____	____	____	____	____
7. Inadequate leasing markets and agreements fail to put agricultural land into good use.....	____	____	____	____	____
8. Owned land is farmed more efficiently than rented land.....	____	____	____	____	____
9. Renting additional land can improve farm profits.....	____	____	____	____	____
10. A farmer with very little formal education can be a success today.....	____	____	____	____	____
11. With changing market prices, a farmer should have both crops and livestock to reduce the risk of financial loss.....	____	____	____	____	____
12. People rent land only when they lack the cash or credit to buy the land.	____	____	____	____	____
13. Owning land means less money spent on land in the long run.....	____	____	____	____	____
14. Urban expansion on to rural agricultural land should be controlled.....	____	____	____	____	____
15. It costs more to operate a farm when you do <u>not</u> have a permanent farm residence.....	____	____	____	____	____
16. Foreign ownership of Alberta farmland should be controlled.....	____	____	____	____	____
17. Renting land causes uncertainty and the risk of <u>not</u> having land to farm.	____	____	____	____	____
18. Keeping records on your farm residence is a waste of time.....	____	____	____	____	____
19. The non-resident farmer farms the land as well as the resident farmer...	____	____	____	____	____
20. The Provincial government should supply financial assistance to those who are just starting to farm.....	____	____	____	____	____
21. Hutterites should be allowed to purchase as much land as they want.....	____	____	____	____	____
22. Land ownership means certainty of having land to farm.....	____	____	____	____	____

SECTION B

We would like you to answer the following questions on your farm operation. All answers are CONFIDENTIAL.

1. How many acres did you farm in 1977 that were:

Owned	_____ acres	Estimated market value $ _____
Rented/leased	_____ acres	Estimated market value $ _____
Managed	_____ acres	Estimated market value $ _____

2. What are the main products produced on your farm?

Livestock				Crops			
Dairy	_____	Sheep.....	_____	Wheat.....	_____	Potatoes.....	_____
Beef	_____	Horses.....	_____	Barley.....	_____	Vegatables.....	_____
Hogs	_____	Poultry.....	_____	Oil seed...	_____	Pasture and forage...	_____
Honey	_____	Other (Please specify)	_____	Small grain	_____	Other (Please specify)	_____

3. Do you operate your farm business as a:

Private individual.....	_____	Partnership - formal.....	_____
Partnership - husband-wife	_____	- informal.....	_____
- father-son	_____	Corporation - family.....	_____
Cooperative.....	_____	- other than family	_____
		Other (Please specify)	_____

4. In 1977, the main sources of income on your farm were: (Please indicate percent.)

Farm production	_____	
Off-farm employment		
by operator	_____	→ Place of employment (eg. Medicine Hat) _____
by wife	_____	→ Place of employment (eg. Medicine Hat) _____
by children	_____	→ Place of employment (eg. Medicine Hat) _____
Other.....	_____	
	100%	

5. What do you think are the percentage values of your farm investments?

Owned land	_____
Rented/leased land	_____
Buildings	_____
Livestock	_____
Feed and supplies	_____
Machinery and equipment	_____
	100%

6. Do you own a non-farm residence in:

Hilda	_____	Medicine Hat	_____
Schuler	_____	Other (Please specify)	_____

7. Why do you have a non-farm residence?

_____

8. Where do you go to purchase the following:

	Hilda	Schuler	Medicine Hat	Other (Please specify)
a) Clothing.....	_____	_____	_____	_____
b) Furniture.....	_____	_____	_____	_____
c) Gas and oil.....	_____	_____	_____	_____
d) Groceries.....	_____	_____	_____	_____
e) Fertilizer.....	_____	_____	_____	_____
f) Farm machinery.....	_____	_____	_____	_____
g) Weed and livestock sprays	_____	_____	_____	_____

9. How many months have you lived on your farm in the past year (Jan. 1 to Dec. 31,1977)?

1 - 4 months _____ 7 - 8 months _____ 11 - 12 months..... _____
5 - 6 months _____ 9 - 10 months _____ Did not live on holding _____

10. How many years have you farmed in the Hilda-Schuler area? _____ years.

11. How much longer do you intend to farm? _____ years.

12. Would you be willing to expand your operation in the future if the opportunity arose?

Yes ____ Why? _____
No ____ Why? _____

13. What is the location of your main farmstead? _____1/4 Section ____ Township ____ Range ____

14. Do you farm any detached parcels of land from your main farmstead?

Yes ____ If yes, please answer questions 15 to 24.
No ____ If no, please skip to question 25.

15.

	Detached Parcels				
	1	2	3	4	5
a) What is their location? (eg. N 1/2 - 36-17-3)					
b) What is their land use? (eg. crops, pasture)					
c) Which parcels did you rent/lease in 1977? Please check (✓).					
d) How often do you fertilize them? (eg. once every two years)					

* Please use reverse side of page for additional detached parcels.

16. What is the land use of the main farmstead? _____

17. If the detached parcels have a different land use than the main farmstead, please explain why.

_____

18. Has there been any vandalism or theft on your detached parcels? Yes _____ No _____

19. Would you be willing to swap land parcels to obtain land closer to the main farmstead?
    Yes _____ Why? _____
    No _____ Why? _____

20. Would you be willing to pay more for land adjacent to the main farmstead than cheaper land farther away?
    Yes _____ Why? _____
    No _____ Why? _____

21. Which machinery do you move to the detached parcels?

Combine	____	Swather	____	Harrows	____	Rake	____
Tractor	____	Discer	____	Half ton truck	____	Baler	____
Seeder	____	Grain auger	____	Cattle trailer	____	Hay rack	____
Cultivator	____	Grain truck	____	Other (Please specify)	____		

22. Would you say there is more wear and tear on your machinery when you drive on paved or gravel roads instead of on the field? Please explain.
    Yes ____ _____
    No ____ _____

23. Have you encountered any scheduling difficulties (eg. right machine in the right field at the right time)? Yes ____ No ____

24. Why did you purchase or rent/lease a detached parcel instead of land adjacent to the main farmstead?

_____

25. How far would you be willing to travel from the main farmstead to farm a 160, 320, 480, or 640 acre piece of land? Please check (✓) appropriate column(s).

	Miles									
	1	2	3	4	5	6--10	11--20	21--40	40--60	60 or more
160 acres	___	___	___	___	___	___	___	___	___	___
320 acres	___	___	___	___	___	___	___	___	___	___
480 acres	___	___	___	___	___	___	___	___	___	___
640 acres	___	___	___	___	___	___	___	___	___	___

26. With what ethnic heritage does your family most strongly identify with?

English	____	French	____	Norwegian.....	____
German	____	Scottish	____	Other (Please specify)	_____

27. In agriculture, much of the knowledge and expertise is learned "on the farm".
    a) Did you grow up on the farm? Yes ____ No ____
    b) How many years have you farmed with: Your father ____ Other relatives ____
    On your own ____ Others..... ____
    c) How many children do you have? ____
    d) How many of your children help you with the farm work? ____
    e) Do you have any hired hands besides relatives? Yes ____ No ____

28. At what education level did you complete formal schooling?
    Grades 1 to 6 ____ Some university/technical college courses ____
    Grades 7 to 9 ____ University degree or technical diploma... ____
    Grades 10 to 13 ____ Post graduate degree..... ____

29. Has your wife or children ever attended any agricultural courses at a university or technical college? Yes ____ No ____

30. To which organizations does your family belong? Please check (✓).
    4 - H club ____ Paterson ____
    P. F. R. A. ____ Alberta Wheat Pool ____
    B. T. Grazing Association ____ Pioneer Grain Company ____
    Many Island Grazing Association ____ United Grain Growers ____
    Drowning Ford Grazing Association ____ Other (Please specify) ____
    Canadian Hereford Association ____

31. Marital Status: Single (never married) ____ Widowed ____
    Married (incl. separation) ____ Divorced ____

32. Sex: Male ____
    Female ____

33. In what age group are you? Under 25 ____ 35 to 44 ____ 55 to 64 ____
    25 to 34 ____ 45 to 54 ____ over 65 ____

34. In 1977, your gross family income was:
    0 to 14,999 ____ 45,000 to 59,999 ____ 90,000 to 104,999 ____
    15,000 to 29,999 ____ 60,000 to 74,999 ____ 105,000 to 120,000 ____
    30,000 to 44,999 ____ 75,000 to 89,999 ____ over 120,000 ____

Please answer this section if you leased or rented land in 1977, if not please skip to section D.

1. What type(s) of land lease(s) or rental agreement(s) did you have in 1977? Please complete the appropriate columns.

Type of agreement	Number of acres	Number of years held	Number of years of agreement	Agreement written	Agreement verbal
Private cultivated land..					
Public cultivated land...					
Private grazing.....					
Public grazing.....					
Water rights.....					
Pasture.....					
Hay.....					

2. Is there provision for renewal(s)? On all agreements _____
On some agreements _____
None of the agreements _____

3. How was the rent paid? Please complete the appropriate columns.

Type of agreement	Share (eg. your share, 1/3)	Cash Straight	Cash Flexible	Combination Share and Cash	Other (Please specify)
Private cultivated land.....					
Public cultivated land.....					
Private grazing.....					
Public grazing.....					
Water rights.....					
Pasture.....					
Hay.....					

4. What kind of lease/rental agreement do you prefer?
Straight cash _____ Crop - share _____ Combination cash and share _____
Flexible cash _____ Livestock - share _____ Other (Please specify) _____

5. What length of lease(s) or rental agreement(s) would you prefer?
Short term - 1 year _____ Intermediate Long term - greater
- 2 to 5 years _____ 6 to 10 years _____ than 10 years..... _____
Why?

6. Are you renting or leasing different land in 1978 than last year? Yes ____ No ____

7. Did you rent any farm machinery in 1977? Yes ____ No ____

8. What information or whose advice do you seek out prior to making a land lease/rental agreement?

None ____ Lawyer ____ Government publication ____
Family ____ Accountant ____ Newspaper/Magazine/Textbook ____
Neighbour ____ District Agriculturist ____ Other (Please specify) _____

9. Your main landlord.

a) Landlords major occupation?

Active farmer ____ Widow ____ Private company ____
Retired farmer ____ Government ____ Other (Please specify) _____

b) How long have you known him? _____ years

c) Are you related to the owner? No ____ Yes ____ If yes, what relation? _____

d) Where does the landlord live? On a farm..... ____ In a rural village/town ____
On an acreage (1 to 5 acres) ____ In the city..... ____

e) How far is that from the rented property? _____ miles.

10. Why do you rent or lease land instead of buying land? _____

SECTION D

Please answer all of this section if you owned land in 1977, if not skip to section E.

1. How did you obtain each portion of your owned land? (Please state the number of acres.)

Homestead _____acres Inheritance/gift _____acres Hudsons Bay Company _____acres
School land _____acres Purchase from a relative _____acres Can. Pacific Railroad Co. _____acres
Pre-emption _____acres Purchase from another farmer _____acres Other (Please specify)
_____ _____acres

2. Would you like your children to take over the farm? Yes____ No____

3. Do you plan to sell any portion or all of your farm in the next five years? Yes____ No____ Don't know ____

4. Are you looking for additional land?

	No	Yes	How many acres?
to own	____	____	_____
to rent/lease	____	____	_____

5. How many acres of your land did you rent to relatives, in 1977? _____acres.
6. How many acres of your land did you rent to non-relatives, in 1977? _____acres.
7. Did you rent any of your machinery to other farmers, in 1977? Yes____ No____
8. Did you rent or lease any of your owned land before you bought it? Yes____ No____
9. Do you own any non farm property? Yes____ No____

SECTION E

Please answer this section regardless of whether you owned or rented land.

1. What are your recommendations for easing the present shortage and/or high cost of agricultural land today?

2. Is the price for farm products too low or are machinery costs too high? Please comment on this statement.

3. Please use the space provided to comment on any section or question in the survey.

THANK YOU FOR YOUR TIME AND COOPERATION.

Gordon Willis
Department of Geography
University of Alberta
Edmonton, Alberta

DEPARTMENT OF GEOGRAPHY
TELEPHONE (403) 432-3274

THE UNIVERSITY OF ALBERTA
EDMONTON, CANADA T6G 2H4

November 29, 1978

Dear Sir/Madam:

A short time ago, a survey questionnaire on rural land tenure was mailed to you. If you have replied, thank you for your cooperation.

If you have not returned the survey, your completion of the questionnaire as soon as possible will be greatly appreciated. In case you are concerned the individual responses to this survey questionnaire will be kept in confidence, and will not be made available to any government or public agency. Thank you.

Yours sincerely,

Gordon K. Willis

Gordon K. Willis

APPENDIX C

Comparison Between Questionnaire Respondents and Census Data

University of Alberta

Chi-square (X^2) Goodness of Fit Tests

a) Age of the Farm Operator

Age Grouping

	0-24	25-34	35-44	45-54	55-64	> 64	Total
E.A.	15 (9.94)	41 (44.75)	57 (55.32)	53 (55.94)	49 (46.0)	10 (13.05)	225
S.A.	1 (6.06)	31 (27.25)	32 (33.68)	37 (34.06)	25 (28.0)	11 (7.95)	137
Total	16	72	89	90	74	21	362

$X^2 = 10.57$; d.f. = 5; $p < .01$

b) Education Level

Level of Education

	0-13 Years	Some Technical or University	Technical Diploma or University Degree	Total
E.A.	565 (569.7)	45 (45.95)	65 (59.3)	675
S.A.	117 (112.3)	10 (9.05)	6 (11.69)	133
Total	682	55	71	808

$X^2 = 3.67$; d.f. = 2; $p < .01$

c) Ethnicity*

Ethnic Group

	British Isles (English and Scottish)	German and Russian	French	Other	Total
I.D.	230 (228.3)	725 (729.05)	5 (5.29)	60 (53.3)	1,020
S.A.	29 (30.67)	102 (97.92)	1 (.71)	5 (7.7)	137
Total	259	827	6	65	1,157

$X^2 = 2.2$; d.f. = 3; $p < .01$

d) Residence Pattern

Length of Residence

	9-12 Months	1-8 Months	Non-Resident	Total
I.D.	619 (619.04)	59 (56.75)	162 (164.22)	840
S.A.	101 (100.96)	7 (9.25)	29 (26.78)	137
Total	720	66	191	977

$X^2 = .85$; d.f. = 2; $p < .01$

LEGEND: S.A. = Questionnaire respondents from study area.

E.A. = Enumeration areas twelve to fifteen, 1976 Census.

I.D. = Improvement District No. 1, 1976 Census.

* = Census data on ethnicity was based on the 1971 Census.

NOTE: A large chi-square value indicates a poor fit while a small chi-square value means a good fit or similarity.

SOURCE: Questionnaire results of the study.

: Statistics Canada, 1971 and 1976 Census Catalogues